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MANAGEMENT

A BIBLIOGRAPHY FOR NASA MANAGERS

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system during 1988.



National Aeronautics and Space Administration
Office of Management
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FOREWARD

Management gathers together references to pertinent documents — reports, journal articles, books — that will assist the NASA manager to be more productive. Items are selected and grouped according to their usefulness to the manager as *manager*. A methodology or approach applied to one technical area may be worthwhile for a manager in a different technical field.

Individual sections can be quickly browsed. Indexes will lead quickly to specific subjects or items.

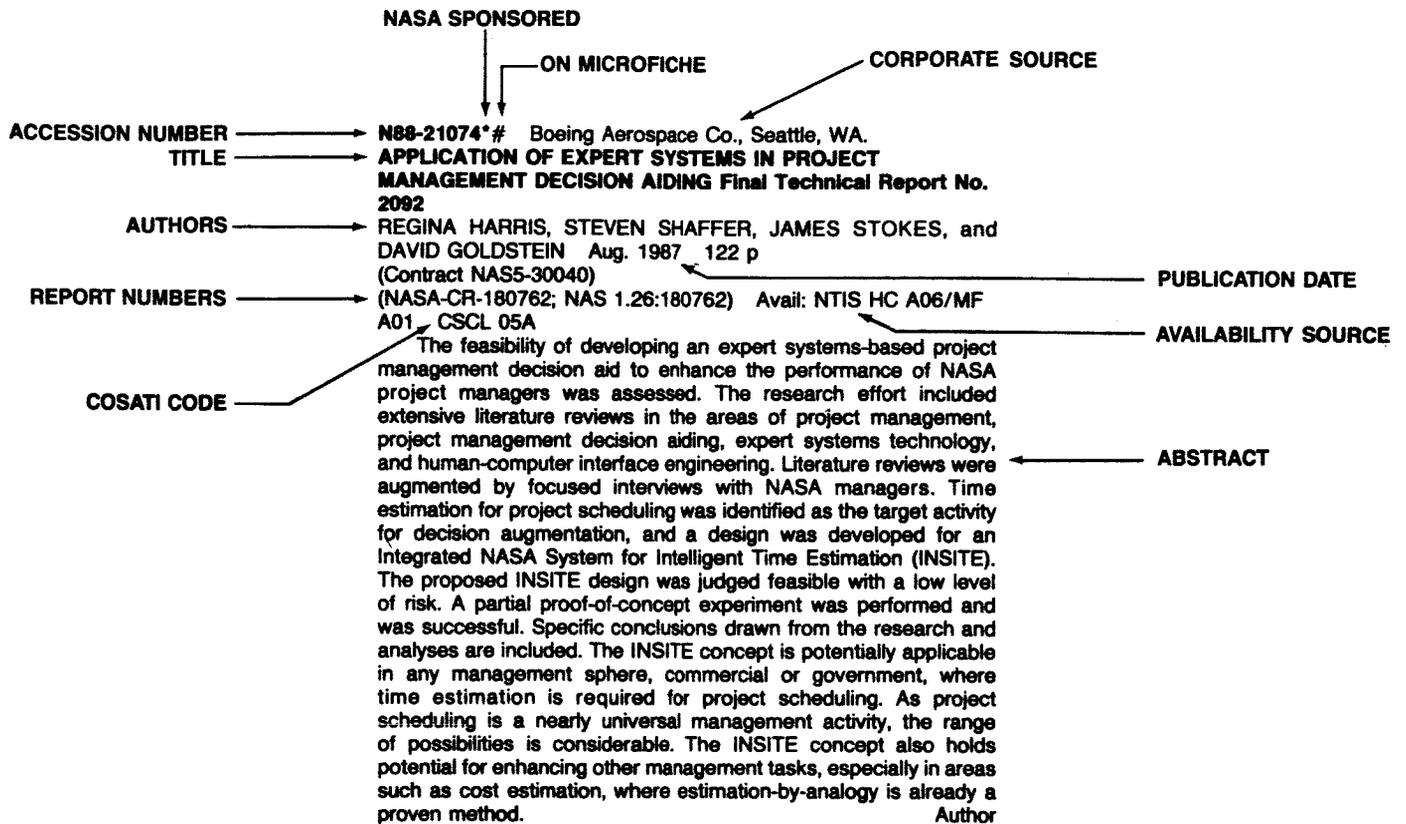
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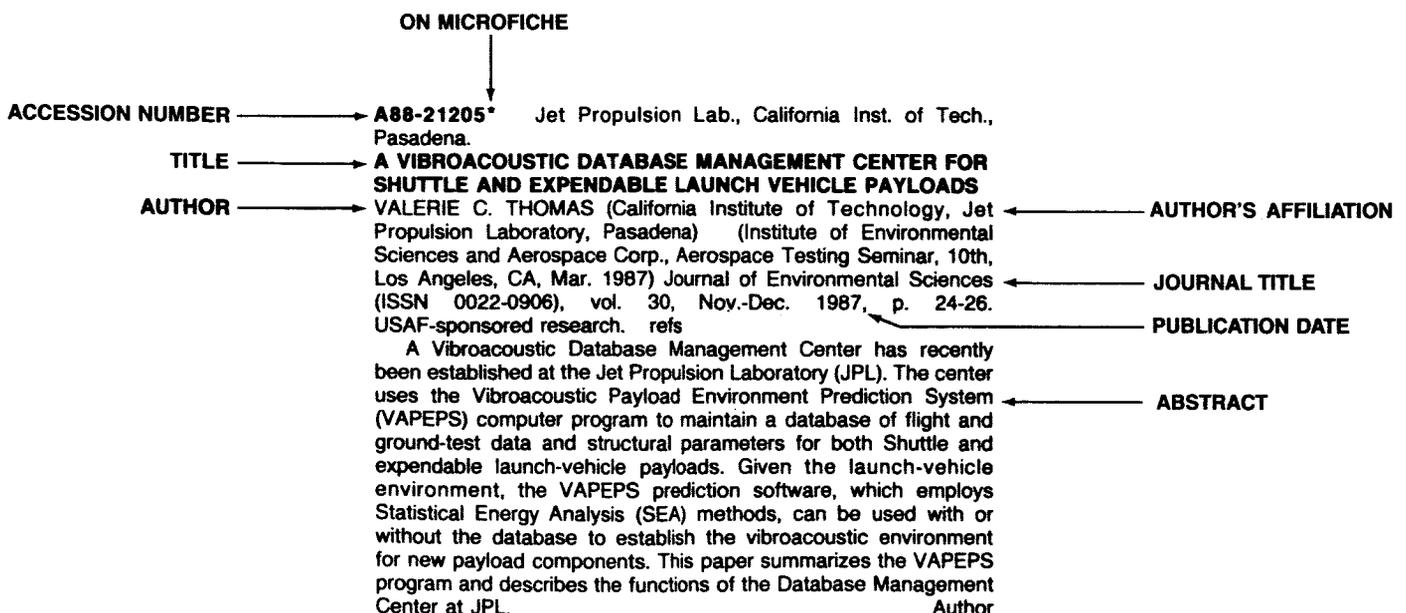
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TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE AND ABSTRACT



APRIL 1989

01

HUMAN FACTORS AND PERSONNEL ISSUES

Includes Organizational Behavior, Employee Relations, Employee Attitudes and Morale, Personnel Management, Personnel Development, Personnel Selection, Performance Appraisal, Training and Education, Computer Literacy, Human Factors Engineering, Ergonomics, Human-Machine Interactions.

A88-10958*# Texas Univ., Austin.

THE ROLE OF PSYCHOLOGISTS IN FUTURE SPACEFLIGHT
ROBERT L. HELMREICH (Texas, University, Austin) SPACEFAIR '85, Meeting, Boston, MA, Apr. 14, 1985, Paper. 9 p.
(Contract NAG2-137)

The need for psychologists to have a more active role in planning space missions is discussed. It is suggested that it would be beneficial if psychologists conducted research aimed at optimizing the organization, composition, and performance of crews; participated in the selection and training of crews; and monitored the actual performance and adjustment of crews during missions. The areas which require further research and the types of research strategies to be implemented are described. The desirable traits for future space personnel and the role of psychologists in mission control are examined. I.F.

A88-10960*# Texas Univ., Austin.

WHAT CHANGES AND WHAT ENDURES - THE CAPABILITIES AND LIMITATIONS OF TRAINING AND SELECTION
ROBERT L. HELMREICH (Texas, University, Austin) Irish Air Line Pilots Association and Aer Lingus, Flight Operations Symposium, Dublin, Ireland, Oct. 19, 20, 1983, Paper. 13 p. refs
(Contract NAG2-137)

The contributions of psychology to aviation in the areas of selection, training, and evaluation, and the implementation of new technologies are discussed. The concept of personality traits versus modification of human behavior through principles of learning are analyzed. Particular consideration is given to achievement motivation (defined in terms of mastery, work, and competitiveness) and the differences between traits and attitudes. It is argued that personality traits are important dimensions of the self and are useful measures of individual differences. The selection of individuals with desired personality characteristics and the training of personnel to improve crew coordination, flight-deck management, and interpersonal efficacy are examined. I.F.

A88-10961*# Texas Univ., Austin.

TRAINING - BEHAVIORAL AND MOTIVATIONAL SOLUTIONS?
ROBERT L. HELMREICH (Texas, University, Austin) Air Line Pilots Association, Beyond Pilot Error - A Symposium of Scientific Focus, Washington, DC, Dec. 6-8, 1983, Paper. 11 p. refs
(Contract NAG2-137)

Psychological factors which govern interpersonal activities in the cockpit are examined. It is suggested that crew members should be selected based on personality characteristics required for the position and that training does not cause long lasting personality changes, it only teaches and improves task performance skills. The effects of mindlessness as defined by Langer (1978)

and the attribution theory of Jones and Nisbett (1971) on flight deck communications and cockpit management are described. The needs for a new system of training crew members, with emphasis on strategies that induce cognitive processes and awareness, and for field investigations of pilots are discussed. I.F.

A88-12429#

THE ESA ANTHRORACK PROJECT - INTEGRATED RESEARCH IN HUMAN PHYSIOLOGY

D. LINNARSSON (Karolinska Institutet, Stockholm, Sweden) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 8th, Tokyo, Japan, Nov. 4-8, 1986) Physiologist, Supplement (ISSN 0031-9376), vol. 30, Feb. 1987, p. S-10 to S-12.

The ESA project for studying human physiology under the conditions of space flight, termed Anthrorack, is discussed. Consideration is given to the projected experiments, which will study the control of balance and locomotion, cardiovascular dynamics, endocrine responses to fluid and blood shifts, pulmonary function, and metabolism, as well as to the hardware involved in the project. The first flight opportunity for the Anthrorack experiments will be with the Spacelab flight D-2 in the early 1990's. I.S.

A88-12642

MODELS OF PROCEDURAL CONTROL FOR HUMAN PERFORMANCE SIMULATION

PAUL J. STICHA (Human Resources Research Organization, Alexandria, VA) Human Factors (ISSN 0018-7208), vol. 29, Aug. 1987, p. 421-432. refs
(Contract MDA903-81-C-0517)

This paper describes and evaluates two general techniques to simulate human performance of procedural tasks. A procedural task is characterized as a partial ordering of task elements in which the control of task-element sequencing is represented within the task, rather than as an interaction between the task and the environment in which the task is performed. The primary concern in simulating the performance of procedures is determining the mechanism that controls task-element sequencing. Two modeling frameworks have been used to represent task-element sequencing. The first method represents the constraints on task-element sequencing directly in a network. A second method represents sequencing constraints indirectly as a set of production rules. Both frameworks offer considerable generality and flexibility in the kinds of structures that can be represented. The relative advantages of the two methods depend upon the questions addressed by the model and the characteristics of the tasks being modeled.

Author

A88-12951*

PHYSIOLOGIC ADAPTATION OF MAN IN SPACE; PROCEEDINGS OF THE SEVENTH INTERNATIONAL MAN IN SPACE SYMPOSIUM, HOUSTON, TX, FEB. 10-13, 1986

ALBERT W. HOLLAND, ED. Symposium sponsored by NASA, Universities Space Research Association, Baylor University, and International Academy of Astronautics. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Sept. 1987, 288 p. For individual items see A88-12952 to A88-13004.

Topics discussed in this volume include space motion sickness, cardiovascular adaptation, fluid shifts, extravehicular activity,

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general physiology, perception, vestibular response modifications, vestibular physiology, and pharmacology. Papers are presented on the clinical characterization and etiology of space motion sickness, ultrasound techniques in space medicine, fluid shifts in weightlessness, Space Shuttle inflight and postflight fluid shifts measured by leg volume changes, and the probability of oxygen toxicity in an 8-psi space suit. Consideration is also given to the metabolic and hormonal status of crewmembers in short-term space flights, adaptive changes in perception of body orientation and mental image rotation in microgravity, the effects of a visual-vestibular stimulus on the vestibulo-ocular reflex, rotation tests in the weightless phase of parabolic flight, and the mechanisms of antimotion sickness drugs. I.S.

A88-13236* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

REACHING FOR THE STARS: THE STORY OF ASTRONAUT TRAINING AND THE LUNAR LANDING

STANLEY H. GOLDSTEIN NASA, Johnson Space Center, Houston, TX New York, Praeger Publishers, 1987, 204 p.

The training for the Mercury, Gemini, and Apollo programs is described. The form and function of training and the historical background which shaped the nature of that training are reviewed. For the three programs, the astronaut selection, the meeting of training requirements, and program management are addressed. C.D.

A88-16145#

SPACE TOPICS INSPIRE UNIVERSITY CAMPUS

EDWARD G. HOWARD (Colorado, University, Colorado Springs) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs (IAF PAPER 87-518)

The development of the new space studies program at the University of Colorado in Colorado Springs is examined. The program began with the appointment of a Director of Space Studies who is to oversee the project and enhance student interest in space. The Masters of Engineering Space Operations Option offered by the University is described. The need for interdisciplinary projects in order to promote space studies is discussed, and examples of space related courses in departments other than engineering are presented. The use of campus TV and radio and art and space displays to create interest in space studies is considered. I.F.

A88-17922

BEFORE LIFT-OFF: THE MAKING OF A SPACE SHUTTLE CREW

HENRY S. F. COOPER, JR. Baltimore, MD, Johns Hopkins University Press, 1987, 285 p.

This book is a day-to-day story of the training of the seven men and women who orbited the earth on Space Shuttle Mission 41-0G, and of the flight itself. The use of simulators, the training exercises, and the roles of instructors are shown. The interrelationships of the crew members from the formation of the mission through its completion is described. C.D.

A88-20069

ENHANCING THE QUALITY OF SPACE EDUCATION THROUGH PROGRAMME EVALUATION

BETTYE B. BURKHALTER (Auburn University, AL) and GEORGE S. JAMES (Rocket Research Institute, Inc., Glendale, CA) British Interplanetary Society, Journal (ISSN 0007-084X), vol. 40, Nov. 1987, p. 519-526. refs

The basis of astronautics-related educational programs' evaluation is a threefold method involving the formulation of objectives in measurable terms, the careful planning of instructional activities, and the selection of those measures by which the attainment of each objective will be determined. A detailed account is given of the management of these processes. The data acquired through the evaluation process can be used to justify further funding or support from the public and political forces that control such resource bases. O.C.

A88-22330*# Loyola Univ., Chicago, IL.

CREW PRODUCTIVITY ISSUES IN LONG-DURATION SPACE FLIGHT

JOHN M. NICHOLAS (Loyola University, Chicago, IL), H. CLAYTON FOUSHEE (NASA, Ames Research Center, Moffett Field, CA), and FRANCIS L. ULSCHAK (H. Lee Moffitt Cancer Research Institute, Tampa, FL) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 13 p. refs (AIAA PAPER 88-0444)

Considerable evidence suggests the importance of teamwork, coordination, and conflict resolution to the performance and survival of isolated, confined groups in high-technology environments. With the advent of long-duration space flight, group-related issues of crew functioning will take on added significance. This paper discusses the influence of crew roles, status, leadership, and norms on the performance of small, confined groups, and offers guidelines and suggestions regarding organizational design, crew selection, training, and team building for crew productivity and social well-being in long-duration spaceflight. Author

A88-22718

HIRING, FIRING, AND RETIRING - RECENT DEVELOPMENTS IN AIRLINE LABOR AND EMPLOYMENT LAW

FRANKLIN A. NACHMAN (Semple and Jackson, Denver, CO) Journal of Air Law and Commerce (ISSN 0021-8642), vol. 53, Fall 1987, p. 31-84. refs

Recent significant developments in labor and employment cases involving the airline industry are analyzed. Cases arising under the Age Discrimination in Employment Act and Title VII of the Civil Rights Act of 1964 are reviewed. Expanding theories of the law of wrongful discharge are discussed with emphasis placed on the ways in which these theories have affected the airline industry. K.K.

A88-30185

THE SOVIET COSMONAUT TEAM, 1978-1987

REX HALL British Interplanetary Society, Journal (Soviet Astronautics) (ISSN 0007-084X), vol. 41, March 1988, p. 111-116. refs

The crews who have flown missions in Soyuz-T and Soyuz-TM spacecraft starting in 1980 are considered. The new cosmonauts appointed in 1976-1978, the crews on Soyuz-T test flights, the Salyut 7 training group, visiting mission training groups, the operational Salyut 7 group, the second Salyut 7 residency, international missions in 1984, a visiting mission in 1984, and Salyut 7 operations in 1984 are covered. The crew involved in the rescue of Salyut 7 are cited, and the various Mir crews are given. C.D.

A88-35087

CURRENT DEVELOPMENTS IN INTERNATIONAL SPACE EDUCATION

RICHARD H. SCHECK IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 545-547. (AAS PAPER 86-457)

U.S. Senator Spark Matsunaga, a leading proponent of Soviet-American space activities cooperation, has proposed that an International Space Year be instituted for 1992 in order to foster cooperative efforts by scientists and scholars in the same way as the 1957 International Geophysical Year; he hopes a joint U.S./U.S.S.R. mission to Mars will be a prominent outcome of the 1992 exchanges. An account is presently given of additional international space-related educational and scholarly exchanges under the aegis of the U.N. and of major museums and universities. O.C.

A88-35401

HUMAN FACTORS SOCIETY, ANNUAL MEETING, 31ST, NEW YORK, NY, OCT. 19-23, 1987, PROCEEDINGS. VOLUMES 1 & 2

Meeting organized by the Human Factors Society; Sponsored by

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the American Telephone and Telegraph Co., Bell Communications Research, Inc., IBM, et al. Santa Monica, CA, Human Factors Society, 1987, p. Vol. 1, 753 p.; vol. 2, 728 p. For individual items see A88-35402 to A88-35498.

Topics discussed include macroergonomics, automation safety, general techniques of test and evaluation, issues in training design, performance issues in displays and control, biomechanical methods, the criterion task set, simulator sickness, capacity limitations in human information processing, and the use of physiological measures in aviation-related research. Attention is also given to ergonomic design, hands and gloves, database access and format, environmental design, visual and auditory detection performance, development of test methods, and tools and techniques for interface design. B.J.

A88-35425

RELATIONSHIP BETWEEN CRITERION TASK SET PERFORMANCE AND THE PERSONALITY VARIABLES OF SENSATION SEEKING AND STIMULUS SCREENING

KIRBY GILLILAND, ROBERT SCHLEGEL, and SHARON DANNELS (Oklahoma, University, Norman) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 402-404. refs
(Contract F33615-85-D-0514)

The purpose of this study was to demonstrate the utility of the Criterion Task Set (CTS) as a method for personality theory testing. Subjects in a large CTS Standardization study were administered the Sensation Seeking scale and the Stimulus Screening scale, two personality dimensions based theoretically on perceptual or biological processes that are believed to mediate task performance. Results indicated that high sensation seekers respond faster, but not necessarily more accurately, than low sensation seekers to central processing tasks. No differences were found for input/perceptual or motor/output tasks. Also, no differences were found between screeners and nonscreeners for any CTS tasks. The results of this study suggest that the CTS can be used profitably by personality researchers to test the basic assumptions of the theories of some personality dimensions. Author

A88-35426

THE CRITERION TASK SET - AN UPDATED BATTERY

JOHN R. AMELL (Systems Research Laboratory, Inc., Dayton, OH), F. THOMAS EGGEMEIER (Dayton, University; USAF, Harry G. Armstrong Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), and WILLIAM H. ACTON (New Mexico, University, Albuquerque) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 405-409. refs

The Criterion Task Set (CTS) is a battery of human performance tasks designed to place demands on a range of operator information processing functions required in complex tasks. Several tasks in the CTS have been modified as a result of validation studies carried out on the original battery. New loading levels for these tasks have been established. In addition to task changes, several modifications have been made in the user interface. Added features include: a 30-sec trial option, automatic trial number incrementing, a file naming convention, and a data reduction program. B.J.

A88-35437* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SIMULATOR SICKNESS RESEARCH PROGRAM AT NASA-AMES RESEARCH CENTER

MICHAEL E. MCCAULEY (Monterey Technologies, Inc., Carmel CA) and ANTHONY M. COOK (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 502-504. refs

The simulator sickness syndrome is receiving increased attention in the simulation community. NASA-Ames Research

Center has initiated a program to facilitate the exchange of information on this topic among the tri-services and other interested government organizations. The program objectives are to identify priority research issues, promote efficient research strategies, serve as a repository of information, and disseminate information to simulator users. Author

A88-35439

THE EFFECTS OF MODALITY AND STRESS ACROSS TASK TYPE ON HUMAN PERFORMANCE

KENNETH L. PAMPERIN and CHRISTOPHER D. WICKENS (Illinois, University, Savoy) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 514-518. refs
(Contract DAAA15-86-K-0013)

This investigation integrates four different approaches to the study of attention and multiple task performance, to include the effects of stimulus modality presentation, the influence of spatial separation in visual stimulus presentation, the effects of stress, and the influence of task type (dual-task versus information-integration task), in a spatial vector monitoring task. A significant benefit of cross-modal (visual-auditory) presentation was found when information was integrated at both levels of stress, while an interaction between modality and stress level occurred in the dual task condition, favoring the intra-modal (visual-visual) presentations at the lower stress level. The auditory display tended to be more stress resistant. The results support Kahneman's (1973) concept of stress-related resource expansion, provide weak support for perceptual narrowing, and provide little support for a processing modalities dimension of the Multiple Resource Model. Author

A88-35444* Illinois Univ., Urbana-Champaign.

ATTENTION THEORY AND TRAINING RESEARCH

JAMES G. CONNELLY, JR., CHRISTOPHER D. WICKENS, GAVAN LINTERN, and KELLY HARWOOD (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 648-651. Sponsorship: 0. refs
(Contract NAG2-308)

This study used elements of attention theory as a methodological basis to decompose a complex training task in order to improve training efficiency. The complex task was a microcomputer flight simulation where subjects were required to control the stability of their own helicopter while acquiring and engaging enemy helicopters in a threat environment. Subjects were divided into whole-task, part-task, and part/open loop adaptive task groups in a transfer of training paradigm. The effect of reducing mental workload at the early stages of learning was examined with respect to the degree that subordinate elements of the complex task could be automated through practice of consistent, learnable stimulus-response relationships. Results revealed trends suggesting the benefit of isolating consistently mapped sub-tasks for part-task training and the presence of a time-sharing skill over and above the skill required for the separate subtasks. Author

A88-35445

HIGH PERFORMANCE COGNITIVE SKILL ACQUISITION - PERCEPTUAL/RULE LEARNING

ARTHUR D. FISK (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1987, p. 652-656. refs
(Contract F30602-81-C-0193)

Two experiments examined the effects of inter-component consistency on skill acquisition in a class of cognitive demanding tasks requiring rapid integration of information as well as rapid application of rules. The role of consistency of external stimulus-to-rule linkage in facilitating the learning and performing of a rule-based classification task was examined. The present data have implications for the understanding and training of skilled problem solving tasks. When training allows the development of automatization of subcomponents of the problem solving activity,

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the chance of memory overload is reduced. The present data point to one such trainable subcomponent clearly present in most real-world problem solving situations - the perceptual and rule-based components. Author

A88-35464

THE INTERACTION OF BOTTOM-UP AND TOP-DOWN CONSISTENCY IN THE DEVELOPMENT OF SKILLS

NATALIE A. ORANSKY, PAULA R. SKEDSVOLD (South Carolina, University, Columbia), and ARTHUR D. FISK (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1987, p. 1044-1048. refs

(Contract F30602-81-C-0193)

An experiment is reported that was conducted to examine the possible value of higher-order consistency in skill development. Subjects made judgments about ordinal properties of stimuli. The presence or absence of consistency was defined by the type of decision -- consistent or varied decisions. In both decision conditions the stimuli were inconsistent at the individual stimulus level; however, subjects making consistent decisions concerning the stimuli could make use of consistent relationships among the stimuli. Subjects in the consistent decision were faster and more accurate at identifying target stimuli when compared with the inconsistent decision subjects. In addition to the quantitative differences, subjects receiving consistent decision training were qualitatively different in performance when compared to the inconsistent decision group. The pattern of results from the present experiment is quite consistent with previous memory/visual search investigations. The experiment supports the suggestion that local level (or stimulus based) consistency is not necessary for automatic process development if task relevant higher-order (or global) consistency can be identified and used by the trainees. Author

A88-35481

TRAINING DEVELOPMENT FOR COMPLEX COGNITIVE TASKS

JOAN M. RYDER, RICHARD E. REDDING, and PETER F. BECKSCHI (Pacer Systems, Inc., Horsham, PA) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1987, p. 1261-1265. USAF-supported research. refs

The Instructional Systems Development (ISD), introduced as a military training methodology in the 1970's and based on psychological principles derived mainly from behaviorism, was adequate for training for tasks with fixed procedural sequences and largely psychomotor skills. This paper evaluates the applicability of ISD to the design of training required for advanced aircraft operators and compares the principles and procedures of the ISD with recently developed training methodologies in order to determine how recent developments in cognitive science can be applied to ISD to modify the training procedures for tasks which require complex cognitive skills. It is concluded that the ISD is still viable if the cognitive approach is used. While the traditional approaches leave later stages of training (automation and fine tuning of skills) to be accomplished on the job, a cognitive approach would concentrate on developing automated skill component practice and skill refinement to build higher levels of expertise. I.S.

A88-37450

PSYCHOSOCIAL TRAINING FOR PHYSICIANS ON BOARD THE SPACE STATION

NICK KANAS (USVA, Medical Center, San Francisco, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, May 1988, p. 456, 457. refs

The training and specialty areas of the physicians who might be sent to the Space Station is discussed. It is argued that these candidates not only should be broadly trained to handle a number of acute physical problems and to conduct research on the effects of weightlessness on the human body physiology, but be also trained to handle various psychological and interpersonal problems

related to long-term isolation and confinement. The knowledge areas that should be included in the psychological training of a space physician are outlined. I.S.

A88-38686*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TRAINING FOR 21ST CENTURY SPACE MISSIONS

FRANK E. HUGHES and ROBERT K. HOLKAN (NASA, Johnson Space Center, Houston, TX) NASA, AIAA, Lunar and Planetary Institute et al., Symposium on Lunar Bases and Space Activities in the 21st Century, Houston, TX, Apr. 5-7, 1988, Paper. 9 p.

Although specific recommendations are difficult to make about spacecraft and missions not yet designed, several general guidelines are presently formulated concerning the training of future, long-duration space mission crews. Training systems should be embedded in the normal controls and displays of the spacecraft used, so that critical maneuvers can be practiced as often as possible. Some system for computer-based training should be available onboard, in order to maintain the spacecraft system-knowledge of the crew at a high level and deepen understanding of malfunction responses. O.C.

A88-38764#

A PROJECT-ORIENTED INTRODUCTION TO FLIGHT TEST ENGINEERING

DONALD T. WARD (Texas A & M University, College Station) AIAA, Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988. 12 p. refs

(AIAA PAPER 88-2116)

This paper describes a flight test course designed to teach senior undergraduates in Aerospace Engineering the fundamentals of flight test engineering. While the engineering subject matter is based on performance and stability and control principles (which are reviewed with emphasis on measurement techniques), the centerpiece of the course is a laboratory project designed to simulate a flight test project similar to ones encountered by a new flight test engineer on his first assignment. Students learn to work in a group, they practice both oral and written communication, and they lay out a schedule of critical events for their project that is used to measure their performance during the course. Two examples of projects assigned are discussed in some detail. The most beneficial outcomes of this project-oriented approach, according to feedback from students, is an opportunity to apply what they have studied for four years. The positive motivation that results has led several of these students to seek jobs in flight test. Author

A88-42921#

TRAINING OF TECHNICAL PERSONNEL FOR QUALITY MAINTENANCE

TRYGVE EIDEM (Helikopter Service A/S, Stavanger, Norway) IN: Vertical flight training needs and solutions; Proceedings of the AHS National Specialists' Meeting, Arlington, TX, Sept. 17, 18, 1987. Alexandria, VA, American Helicopter Society, Inc., 1987, p. 73-76.

The training of technical personnel involved in manufacturing and maintaining rotorcraft is discussed. It is suggested that aircraft manufacturers follow ICAO standards and recommendations for training. Training programs should be evaluated according to goal achievement, cost/benefit analysis, and development of working relationships. Aspects of training to be evaluated include the knowledge, skills, and attitude towards the job of those involved, the company training methods and techniques, the student's study technique and attitude towards training. It is proposed that requirements in basic and specialized training and competence level definitions should be developed. Maintenance organizations and their performance are also examined. R.B.

A88-42961#

THE EVALUATION OF PILOT JUDGMENT DURING CERTIFICATION FLIGHT TESTS

DENIS A. CARAVELLA (FAA, West Chicago, IL) IN: International

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Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 328-336.

A method which evaluates five attitude patterns of pilots during certification tests to examine judgment in addition to skill is discussed. The attitude patterns studied are macho (aggressive/forceful vs. timid), attitude to authority (defiant vs. conformist), persistence (insistent vs. yielding), time of thought (impulsive vs. pondering), and fear (carefree vs. trepid). Examiners look for a balance between the two extremes of each pattern. With this method, a pilot could receive an unsatisfactory determination based on poor judgment, even if all tasks were performed successfully, possibly helping to pinpoint reasons for unsatisfactory performance resulting from poor attitude rather than a lack of skill. R.B.

A88-42963# COCKPIT RESOURCE MANAGEMENT CONCEPTS AND TRAINING STRATEGIES - DEVELOPING AN ANALYSIS OF TRAINING NEEDS

T. L. SAMS (American Airlines, Inc., Fort Worth, TX) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 360-371. refs

A study assessing Cockpit Resource Management (CRM) concepts, training media and instructional methods is presented. A questionnaire was sent to aviation psychologists, airline training directors, and pilots to provide statistics for respondent demographics, the importance of various CRM concepts, training effectiveness for each concept, and CRM training issues, including training media, instructional methods, assessment, and training problems and support. It was found that communications and command/leadership skills were felt to be most important, with very little interest taken in social and interpersonal skills. In the area of CRM media and instructional methods, priority was given to simulation, line-oriented flight training, small group seminars and video tape review of actual CRM case studies. R.B.

A88-42968*# San Jose State Univ., CA. 'BUT CAPTAIN, I'VE BEEN DOING THIS A LOT LONGER THAN YOU HAVE' - THE EFFECTS OF 'ROLE-REVERSAL' ON CREW INTERACTION

SANDRA C. LOZITO (San Jose State University, CA), BARBARA G. KANKI, and H. CLAYTON FOUSHEE (NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 413-418.

Legislation providing for airline deregulation has, among other things, created some ambiguity with respect to cockpit role structures. With the demise of some airlines, the absorption of others, the merging of seniority lists, and a new shortage of pilots, individuals with experience equivalent to or greater than that of the pilot in command may be placed in roles of lesser status. A formerly senior captain may be flying in the right seat as a first officer with an individual very much 'junior' in terms of both age and experience. Moreover, the mandatory retirement of airline pilots at age 60 does not apply to flight engineers, and some are 'down-grading' to fly in that capacity. The effects of this 'role-reversal' phenomenon on the crew coordination process have not been explored. The purpose of this study was to begin investigating this phenomenon using data obtained from a previous 'short-haul' full mission study conducted by Foushee, Lauber, Baetge, and Acomb (1986). Author

A88-42969# THE SYNERGY DIAMOND AS A MODEL FOR HUMAN BEHAVIOR (IN TEAM PROBLEM SOLVING SITUATIONS)

CONRAD S. BIEGALSKI (USAF, Travis AFB, CA) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 419-425.

A model is presented which can be used to depict short-term individual behavior patterns, how behavior affects the team's effort

to develop synergy, positive and negative levels of synergy attainable, and how individuals can modify their behavior to increase their effectiveness as team members. It is noted that the diamond depicts short-term behavior, not attitude or personality. The main limitation of the 'synergy diamond' is that it is neither a graph nor a mathematical model. K.K.

A88-42971*# Texas Univ., Austin. EVALUATING COCKPIT RESOURCE MANAGEMENT TRAINING

ROBERT L. HELMREICH and JOHN A. WILHELM (Texas, University, Austin) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 440-446. refs (Contract NCC2-286)

The determinants of effective or ineffective cockpit resource management and the difficulties these multiple factors pose for validation of the effectiveness of cockpit resource management (CRM) training are discussed. A model of an evaluation design that may be applied to this type of training is presented. Concept validation is discussed as well as criteria for judging crew proficiency. Attention is given to accidents and proficiency checks, incidents and repeated maneuvers, attitude measurement, and self-report evaluation of training. K.K.

A88-42972*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA. SELECTION FOR OPTIMAL CREW PERFORMANCE - RELATIVE IMPACT OF SELECTION AND TRAINING

THOMAS R. CHIDESTER (NASA, Ames Research Center, Moffett Field, CA) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 473-479. Army-supported research. refs (Contract NCC2-286)

An empirical study supporting Helmreich's (1986) theoretical work on the distinct manner in which training and selection impact crew coordination is presented. Training is capable of changing attitudes, while selection screens for stable personality characteristics. Training appears least effective for leadership, an area strongly influenced by personality. Selection is least effective for influencing attitudes about personal vulnerability to stress, which appear to be trained in resource management programs. Because personality correlates with attitudes before and after training, it is felt that selection may be necessary even with a leadership-oriented training curriculum. R.B.

A88-42982# ASSESSMENT OF STUDENT ATTITUDES IN THE FLIGHT TRAINING ENVIRONMENT

DAVID L. HOWELL (New Hampshire, University, Durham) and CATHERINE CASSELMAN VUKSANOVIC IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 544-549. refs

This study was designed to identify student attitudes toward their flight training program to determine if there was a change in student attitude from the beginning of a flight program to the end and to investigate variables that may have had an effect on student attitude toward their flight training program. Means were examined for both pre and post semester groups indicating a trend toward a positive change in attitude. Variables that held significance on the .05 level were the class in which the student was enrolled and students who intended to continue with the same flight instructor. Implications of instructor impact on student performance is discussed. Author

**A88-43004#
'WERE YOU DISTRACTED BY THE OTHER PLANE'S SUDDEN
APPEARANCE?' - THE CASE FOR STANDARDIZED
POST-ACCIDENT INTERVIEWS FOR AIR TRAFFIC
CONTROLLERS**
DARLENE A. COUCHMAN (New Mexico State University, Las

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Cruces) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 733-738. refs

The problem of obtaining early information after accidents is examined, arguing that a standardized set of questions, to be asked of air traffic controllers immediately after an accident, should be designed and implemented to reduce the distortion that occurs due to the influence of past experiences and published or broadcasted news reports of the event. Relevant studies concerning memory, post-accident questionnaires in use, and the need for a preliminary study to develop a standardized questionnaire are discussed, including possible sample questions. It is proposed that a neutral organization such as the FBI should be responsible for isolating and interviewing air traffic controllers, whether or not they could have had a role in the accident. R.B.

A88-43961#

THE OVERVIEW EFFECT - A STUDY OF THE IMPACT OF SPACE EXPLORATION ON INDIVIDUAL AND SOCIAL AWARENESS

FRANK WHITE (Human Systems Inc., Newton, MA) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 120-125. refs

This paper discusses the changes in awareness caused by spaceflight in astronauts, cosmonauts, and society as a whole. The paper reports findings based on interviews with sixteen people who have been in space as well as an examination of secondary materials. The Overview Effect is defined as viewing the earth from space and experiencing its inherent unity as a whole system. In addition, other changes in awareness are described, as are the conditions producing the shifts in perception. A series of propositions is offered as the foundation for continuing research into the philosophy and psychology of the new civilizations now being created on earth and in space. Author

A88-43962#

USE OF A 2-METER RADIUS CENTRIFUGE ON SPACE STATION FOR HUMAN PHYSIOLOGIC CONDITIONING AND TESTING

PETER H. DIAMANDIS (MIT; Harvard University, Cambridge, MA) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 133-136.

NASA Space Station life sciences experiments are planned to employ two centrifuges of 0.9 and 2.0 m radii; of these, the larger would be used to keep the crew in good health during long duration missions, counteracting the physiologic deconditioning that occurs in extended exposure to microgravity by exerting artificial gravity during sleep. Such exercises as deep knee bends could also be conducted on the 2.0-m centrifuge. The crewmember will be disposed on the centrifuge with head at center and feet at the radially most outward point. O.C.

A88-46443

ISSUES IN MANAGING TOTAL TRAINING SYSTEMS

J. S. BRESEE and C. T. MOORE (Singer Co., Stamford, CT) IN: The acquisition and use of flight simulation technology in aviation training; Proceedings of the International Conference, London, England, Apr. 27-29, 1987. Volume 2. London, Royal Aeronautical Society, 1987, p. 345-355.

The new role of the training support industry in relation to the management of total training systems is examined. Differences between training tools and training systems are assessed, with particular attention given to new measures of product quality, new factors affecting cost and schedule, the difference between specification generation and specification compliance, the management of an interdisciplinary design team, and differences

in managing training systems development and training systems operations. Recommendations for action connected with these issues are presented. B.J.

A88-46514

MENTAL MODELS AND FAILURES IN HUMAN-MACHINE SYSTEMS

GERRIT C. VAN DER VEER (Vrije Universiteit, Amsterdam, Netherlands) IN: Information systems: Failure analysis; Proceedings of the NATO Advanced Research Workshop, Bad Windsheim, Federal Republic of Germany, Aug. 18-22, 1986. Berlin and New York, Springer-Verlag, 1987, p. 221-230. refs

The analysis of failures and failure prevention is analyzed from the viewpoint of cognitive ergonomics or the cognitive psychology of man-computer interactions. The causes of failures and the ways to prevent them are reviewed using theoretical notions on human behavior in man-machine communication processes. B.J.

A88-51496

ENGINEERING DATA COMPENDIUM: HUMAN PERCEPTION AND PERFORMANCE

KENNETH R. BOFF, ED. (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) and JANET E. LINCOLN, ED. (Dayton, University, OH) Wright-Patterson AFB, OH, USAF Aerospace Medical Research Laboratory, 1988, 142 p. No individual items are abstracted in this volume.

Information and instructions for users of the Engineering Data Compendium on human perception and performance are presented. The layout of the two-page entries which make up the Compendium is explained and illustrated with a diagram. A table of contents for volumes 1-3, a glossary of terms, a hierarchically arranged design checklist, and a complete alphabetical index are provided. T.K.

A88-53751#

AEROSPACE DESIGN EDUCATION AT TEXAS A & M UNIVERSITY

THOMAS U. MCELMURRY (Texas A & M University, College Station) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 10 p. (AIAA PAPER 88-4413)

The effectiveness of such aerospace engineering design courses as those taught at Texas A & M University entails the teaching of computational methods and computer programs in basic engineering courses; similarly drawing and technical writing skills should be refined in basic studies prior to enrollment in aerospace studies. A comprehensive and accessible source of design reference material is also essential. Project-oriented aerospace vehicle design electives for the design, development, and demonstration of hardware are highly recommended. O.C.

A88-54856#

COMPUTER-ENHANCED LEARNING

AHMED K. NOOR (George Washington University, Hampton, VA) Aerospace America (ISSN 0740-722X), vol. 26, Sept. 1988, p. 40-42.

The applications of recent advances in aerospace technology to the enhancement of engineering education is considered. The use of computer workstations, expert systems, videodisks, and optical fiber networks is discussed. The benefits of instructional teams using all these technologies are emphasized. C.D.

N88-12240# Ryan Research International, Chico, CA. HEALTH HAZARDS OF VIDEO DISPLAY TERMINALS. A COMPREHENSIVE, ANNOTATED BIBLIOGRAPHY ON A CRITICAL ISSUE OF WORKPLACE HEALTH AND SAFETY WITH SOURCES FOR OBTAINING ITEMS AND LIST OF TERMINAL SUPPLIERS

META NISSLEY, Comp. 1987 67 p (RSI-IAS-4; LC-87-90423; ISBN-0-942158-04-0) Avail: NTIS HC A04/MF A01

A bibliography is presented on health hazards of video display terminals. The comprehensive and annotated bibliography is about critical issues of workplace health and safety. Increasing attention

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is paid to the overall workplace health and comfort of the steadily growing number of video terminal users, and ergonomics is now a central theme in industrial health and safety. Arrangement of items is by title. A name index is also provided for access by author or researcher. E.R.

N88-12924*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

RESEARCH PAPERS AND PUBLICATIONS (1981-1987): WORKLOAD RESEARCH PROGRAM

SANDRA G. HART, comp. Aug. 1987 124 p
(NASA-TM-100016; A-87196; NAS 1.15:100016) Avail: NTIS HC A06/MF A01 CSCL 051

An annotated bibliography of the research reports written by participants in NASA's Workload Research Program since 1981 is presented, representing the results of theoretical and applied research conducted at Ames Research Center and at universities and industrial laboratories funded by the program. The major program elements included: 1) developing an understanding of the workload concept; 2) providing valid, reliable, and practical measures of workload; and 3) creating a computer model to predict workload. The goal is to provide workload-related design principles, measures, guidelines, and computational models. The research results are transferred to user groups by establishing close ties with manufacturers, civil and military operators of aerospace systems, and regulatory agencies; publishing scientific articles; participating in and sponsoring workshops and symposia; providing information, guidelines, and computer models; and contributing to the formulation of standards. In addition, the methods and theories developed have been applied to specific operational and design problems at the request of a number of industry and government agencies. Author

N88-14875*# Houston Univ., TX. Dept. of National Sciences.

A GENERAL ARCHITECTURE FOR INTELLIGENT TRAINING SYSTEMS Final Report

R. BOWEN LOFTIN *In* NASA. Lyndon B. Johnson Space Center, Houston, Tex. NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1987. Volume 2 (date) 15 p Nov. 1987

Avail: NTIS HC A15/MF A01 CSCL 09B

A preliminary design of a general architecture for autonomous intelligent training systems was developed. The architecture integrates expert system technology with teaching/training methodologies to permit the production of systems suitable for use by NASA, other government agencies, industry, and academia in the training of personnel for the performance of complex, mission-critical tasks. The proposed architecture consists of five elements: a user interface, a domain expert, a training session manager, a trainee model, and a training scenario generator. The design of this architecture was guided and its efficacy tested through the development of a system for use by Mission Control Center Flight Dynamics Officers in training to perform Payload-Assist Module Deploys from the orbiter. Author

N88-15433# Joint Publications Research Service, Arlington, VA. **NEW US BOOK ON AVIATION PSYCHOLOGY REVIEWED**

A. A. GYURDZHIAN, V. F. TOKAREV, and YU. YU. SHIPKOV *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, Volume 21, No. 4, July - August 1987 p 126-137 13 Jan. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 4, Jul. - Aug. 1987 p 82-88

Avail: NTIS HC A08/MF A01

The history of aviation psychology in the U.S., basic concepts of aviation psychology, directions, and prospects of its development are covered. The professional performance of a pilot is submitted to psychological analysis. The main guidelines of engineering psychology and its application to the design of information display systems and controls are discussed. Perceptual phenomena of flight work is examined. Individual tendencies and abilities of flight personnel, their work capacity and quality of performance are evaluated. Different aspects of pilot training are discussed. The

advantages of using the systems method to organize air traffic control, conduct research with optimum and mutually complementary distribution of functions among man and machine are discussed. Finally, the methodology of research in aviation psychology, starting with the onset of some problem to practical introduction and the theoretical generalization are discussed.

B.G.

N88-16420*# Alabama Univ., Huntsville. Cognitive Systems Lab.

SPACE LANGUAGES

DAN HAYS *In* NASA. Marshall Space Flight Center, Third Conference on Artificial Intelligence for Space Applications, Part 1 p 333-337 Nov. 1987

Avail: NTIS HC A18/MF A01 CSCL 09B

Applications of linguistic principles to potential problems of human and machine communication in space settings are discussed. Variations in language among speakers of different backgrounds and change in language forms resulting from new experiences or reduced contact with other groups need to be considered in the design of intelligent machine systems. Author

N88-18151# Joint Publications Research Service, Arlington, VA. **PRESENT STAGE OF SPACE MEDICINE**

B. S. ALYAKRINSKIY *In its* JPRS Report: Science and Technology. USSR: Space Biology and Aerospace Medicine, v. 21, no. 6, Nov. - Dec. 1987 p 1-9 11 Mar. 1988 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 6, Nov. - Dec. 1987 p 3-10

Avail: NTIS HC A07/MF A01

Development of Soviet cosmonautics has resulted in considerable achievements referable to many disciplines, including biology and medicine, which originated new scientific directions. Numerous important problems were formulated and solved; results of broad scientific relevance were obtained, and, at the same time, new difficult problems were advanced, which require bold overcoming of many dogmas reinforced by tradition, restructuring of scientific thinking. The real achievements of such restructuring will be the contribution of space medicine to the advances, with which the Soviet Union is celebrating its 70th anniversary of the Great October Socialist Revolution. Author

N88-18515# Sandia National Labs., Albuquerque, NM.

INNOVATION AND CREATIVITY: A CRITICAL LINKAGE

J. M. HUETER 1987 7 p Presented at the College Industry Education Conference, San Diego, Calif., 8 Feb. 1988

(Contract DE-AC04-76DP-00789)
(DE88-003309; SAND-87-2801C; CONF-880234-1) Avail: NTIS HC A02

Creativity involves the associating of hitherto unrelated elements to form a new and useful combination. All have the ability but most seldom use it because of some false beliefs and failure to understand the creative process. Deterrents to creativity include fear of criticism, narrowness of education and training, habit, negative attitudes toward problems, lack of motivation, lack of self-confidence, lack of courage and discouragement by failures. The recognition and development of creative ideas requires mental effort, an open mind, searching seemingly unrelated fields and definition of the problem. Brainstorming is widely used to produce alternate ideas. Modifications of it are the Gordon Technique and Synectics. Morphological analysis and the examination of attributes are other aids to creativity. Recognition of a need, or of a new use of an old idea can be helpful. Management should encourage attempts at creativity. If the will exists, creativity can be developed by conscious effort instead of being left to chance. DOE

N88-19883*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

SPACE STATION HUMAN FACTORS RESEARCH REVIEW.

VOLUME 3: SPACE STATION HABITABILITY AND FUNCTION: ARCHITECTURAL RESEARCH

MARC M. COHEN, ed., ALICE EICHHOLD, ed., and SUSAN HEERS, ed. Oct. 1987 211 p Workshop held at Moffett Field, Calif.,

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3-6 Dec. 1985

(NASA-CP-2426-VOL-3; A-86263-VOL-3; NAS 1.55:2426-VOL-3)
Avail: NTIS HC A10/MF A01 CSCL 05H

Articles are presented on a space station architectural elements model study, space station group activities habitability module study, full-scale architectural simulation techniques for space stations, and social factors in space station interiors.

N88-19886*# Southern California Inst. of Architecture, Santa Monica. Inst. for Future Studies.

SPACE STATION GROUP ACTIVITIES HABITABILITY MODULE STUDY: A SYNOPSIS

DAVID NIXON and TERRY GLASSMAN *In* NASA. Ames Research Center, Space Station Human Factors Research Review. Volume 3: Space Station Habitability and Function: Architectural Research p 145-153 Oct. 1987

Avail: NTIS HC A10/MF A01 CSCL 05H

Space station habitability was studied by investigating crew activity routines, proximities, ergonomic envelopes, and group volumes. Ten alternative schematic interior designs were proposed. Preliminary conclusions include: (1) in-service interior modifications may be necessary and should be planned for; (2) design complexity will be increased if the module cluster is reduced from five to three; (3) the increased crew circulation attendant upon enhancement of space station activity may produce human traffic bottlenecks and should be planned for; (4) a single- or two-person quiet area may be desirable to provide crew members with needed solitude during waking hours; and (5) the decision to choose a two-shift or three-shift daily cycle will have a significant impact on the design configuration and operational efficiency of the human habitat. J.P.B.

N88-19893# European Space Agency, Paris (France).

PROCEEDINGS OF THE 3RD EUROPEAN SYMPOSIUM ON LIFE SCIENCES RESEARCH IN SPACE

J. HUNT, ed. Dec. 1987 339 p Symposium held in Graz, Austria, 14-18 Sep. 1987; sponsored by ESA, the Austrian Solar and Space Agency, and Technische Univ., Graz, Austria (ESA-SP-271; ISSN-0379-6566; ETN-88-91970) Avail: NTIS HC A15/MF A01

The role of ESA in life sciences, and mission opportunities; human physiology in microgravity (respiratory system, cardiovascular system, metabolic systems, neurophysiology, animal models); plant and cell biology; radiation, biophysics, and exobiology; and biotechnology were discussed.

ESA

N88-20827# Douglas Aircraft Co., Inc., Long Beach, CA.

PROCEEDINGS OF THE WORKSHOP ON THE ASSESSMENT OF CREW WORKLOAD MEASUREMENTS METHODS, TECHNIQUES AND PROCEDURES. VOLUME 1: PRELIMINARY SELECTION OF MEASURES Final Report, 24 - 25 Feb. 1987

MICHAEL A. BIFERNO and GEORGE P. BOUCEK, JR. (Boeing Commercial Airplane Co., Seattle, Wash.) Jun. 1987 386 p Workshop held in Long Beach, Calif., 24-25 Feb. 1987 (Contract F33615-86-C-3600) (AD-A189004; AFWAL-TR-3043-VOL-1) Avail: NTIS HC A17/MF A01 CSCL 05H

The objectives of the workshop were to: gather information from workload experts regarding which measures have evidence supporting their reliability or validity; provide an independent review of the facts concerning the validity and reliability of workload measures; and provide a means for systematically reviewing and modifying the fact matrices. A schedule of the events is included.

GRA

N88-22525# Naval Health Research Center, San Diego, CA. **NAPPING AND HUMAN FUNCTIONING DURING PROLONGED WORK** Interim Report

PAUL NAITOH and ROBERT G. ANGUS 30 Apr. 1987 41 p (AD-A190228; NHRC-87-21) Avail: NTIS HC A03/MF A01 CSCL 06J

In prolonged work periods, men and women often forego

satisfying their sleep need to complete their assigned jobs, resulting in an accumulation of performance/mood degrading sleep loss and fatigue. Sleep need can be satisfied only by a slow process of sleeping for an average of 7 to 8 consecutive hours per 24 hour period, i.e., a long period of time-out. However, sleep management suggests that recovery from fatigue and sleepiness during a prolonged work period can be accomplished by short or ultra-short sleep (naps) taken during a prolonged work period. Naps are shown not only to refresh and restore human functioning, but also to maintain performance and mood during a prolonged work period. In this paper, naps power as a counter-degradation measure are described first through the literature review, and then through critical evaluation of studies conducted at the Defense and Civil Institute of Environmental Medicine, Canada and the Naval Health Research Center. GRA

N88-23298# Institut fuer Angewandte Geodaesie, Frankfurt am Main (Germany, F.R.).

MAPS FOR THE BLIND AND METHODS OF THEIR PRODUCTION

EDWIN PODSCHADLI *In* its Contributions to Geodesy, Photogrammetry and Cartography. Series 1, Number 46 p 229-244 1987

Avail: NTIS HC A11/MF A01

Alphabets, teaching aids, and maps for the blind are reviewed. Thermoplastic, silk screen printing, and stereo copying methods of tactile map production are described. ESA

N88-23370*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

MENTAL-STATE ESTIMATION, 1987

J. RAYMOND COMSTOCK, JR., comp. May 1988 393 p Workshop held in Williamsburg, Va., 3-4 Jun. 1987; sponsored by NASA, Langley Research Center, Hampton, Va. and Old Dominion Univ., Norfolk, Va. Sponsored by NASA, Washington (NASA-CP-2504; L-16420; NAS 1.55:2504) Avail: NTIS HC A17/MF A01 CSCL 05J

Reports on the measurement and evaluation of the physiological and mental state of operators are presented.

N88-23371*# Advanced Resource Development Corp., Columbia, MD.

AN OVERVIEW OF CURRENT APPROACHES AND FUTURE CHALLENGES IN PHYSIOLOGICAL MONITORING

RICHARD L. HORST *In* NASA. Langley Research Center, Mental-State Estimation, 1987 p 25-42 May 1988

Avail: NTIS HC A17/MF A01 CSCL 05J

Sufficient evidence exists from laboratory studies to suggest that physiological measures can be useful as an adjunct to behavioral and subjective measures of human performance and capabilities. Thus it is reasonable to address the conceptual and engineering challenges that arise in applying this technology in operational settings. Issues reviewed include the advantages and disadvantages of constructs such as mental states, the need for physiological measures of performance, areas of application for physiological measures in operational settings, which measures appear to be most useful, problem areas that arise in the use of these measures in operational settings, and directions for future development. Author

N88-23384*# Purdue Univ., West Lafayette, IN.

POPEYE: A PRODUCTION RULE-BASED MODEL OF MULTITASK SUPERVISORY CONTROL (POPCORN)

JAMES T. TOWNSEND, HELENA KADLEC, and BARRY H. KANTOWITZ *In* NASA. Langley Research Center, Mental-State Estimation, 1987 p 189-210 May 1988 (Contract NAG2-307)

Avail: NTIS HC A17/MF A01 CSCL 05J

Recent studies of relationships between subjective ratings of mental workload, performance, and human operator and task characteristics have indicated that these relationships are quite complex. In order to study the various relationships and place subjective mental workload within a theoretical framework, we

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developed a production system model for the performance component of the complex supervisory task called POPCORN. The production system model is represented by a hierarchical structure of goals and subgoals, and the information flow is controlled by a set of condition-action rules. The implementation of this production system, called POPEYE, generates computer simulated data under different task difficulty conditions which are comparable to those of human operators performing the task. This model is the performance aspect of an overall dynamic psychological model which we are developing to examine and quantify relationships between performance and psychological aspects in a complex environment. Author

N88-23387*# Massachusetts Univ., Worcester. Dept. of Neurology.

ATTENTION, EFFORT, AND FATIGUE: NEUROPSYCHOLOGICAL PERSPECTIVES

RONALD A. COHEN and BRIAN F. O'DONNELL *In* NASA Langley Research Center, Mental-State Estimation, 1987 p 237-268 May 1988

Avail: NTIS HC A17/MF A01 CSCL 05J

Models of attention, effort, and fatigue are reviewed. Methods are discussed for measuring these phenomena from a neuropsychological and psychophysiological perspective. The following methodologies are included: (1) the autonomic measurement of cognitive effort and quality of encoding; (2) serial assessment approaches to neurophysiological assessment; and (3) the assessment of subjective reports of fatigue using multidimensional ratings and their relationship to neurobehavioral measures. Author

N88-24151*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

NASA-AMES WORKLOAD RESEARCH PROGRAM

SANDRA HART *In* its Space Station Human Factors Research Review. Volume 4: Inhouse Advanced Development and Research p 29-76 May 1988

Avail: NTIS HC A07/MF A01 CSCL 05H

Research has been underway for several years to develop valid and reliable measures and predictors of workload as a function of operator state, task requirements, and system resources. Although the initial focus of this research was on aeronautics, the underlying principles and methodologies are equally applicable to space, and provide a set of tools that NASA and its contractors can use to evaluate design alternatives from the perspective of the astronauts. Objectives and approach of the research program are described, as well as the resources used in conducting research and the conceptual framework around which the program evolved. Next, standardized tasks are described, in addition to predictive models and assessment techniques and their application to the space program. Finally, some of the operational applications of these tasks and measures are reviewed. Author

N88-24162*# Martin Marietta Aerospace, Denver, CO.

TELEOPERATOR HUMAN FACTORS STUDY Final Report

May 1986 68 p

(Contract NAS8-35184)

(NASA-CR-178930; NAS 1.26:178930; MCR-86-542) Avail: NTIS HC A04/MF A01 CSCL 05H

An investigation of the spectrum of space teleoperation activities likely in the 1985 to 1995 decade focused on the resolution of critical human engineering issues and characterization of the technology effect on performance of remote human operators. The study began with the identification and documentation of a set of representative reference teleoperator tasks. For each task, technology, development, and design options, issues, and alternatives that bear on human operator performance were defined and categorized. A literature survey identified existing studies of man/machine issues. For each teleoperations category, an assessment was made of the state of knowledge on a scale from adequate to void. The tests, experiments, and analyses necessary to provide the missing elements of knowledge were then defined.

A limited set of tests were actually performed, including operator selection, baseline task definition, control mode study, lighting study, camera study, and preliminary time delay study. J.P.B.

N88-25156*# McDonnell-Douglas Astronautics Co., Huntington Beach, CA.

HUMAN PERFORMANCE ISSUES ARISING FROM MANNED SPACE STATION MISSIONS

WILLIAM K. DOUGLAS Washington NASA Oct. 1986 61 p

(Contract NAS2-11723)

(NASA-CR-3942; NAS 1.26:3942; MDC-H1363) Avail: NTIS HC A04/MF A01 CSCL 05H

Ten former NASA astronauts were interviewed using a set of 51 questions developed to encourage the contacts to discuss any thoughts, opinions, conclusions, or suggestions which might have evolved since they left the astronaut program. Strict confidentiality was maintained. At least one astronaut from each of the NASA manned space flight programs, excluding the Space Transportation System (Shuttle), was interviewed. The report records the answers to the questions asked, spontaneous comments, and the investigator's own personal evaluations of the material obtained. No statistical analysis of the material was attempted. The professional opinions of these ten experienced astronauts will be of value to persons concerned with the design and operation of manned spacecraft and manned space stations. Author

N88-25372*# Anacapa Sciences, Inc., Santa Barbara, CA.

SPACE STATION HABITABILITY RECOMMENDATIONS BASED ON A SYSTEMATIC COMPARATIVE ANALYSIS OF ANALOGOUS CONDITIONS

JACK W. STUSTER Washington NASA Sep. 1986 209 p

(Contract NAS2-11690)

(NASA-CR-3943; NAS 1.26:3943) Avail: NTIS HC A10/MF A01 CSCL 06K

Conditions analogous to the proposed NASA Space Station are systematically analyzed in order to extrapolate design guidelines and recommendations concerning habitability and crew productivity. Analogous environments studied included Skylab, Sealab, Teklite, submarines, Antarctic stations and oil drilling platforms, among others. These analogues were compared and rated for size and composition of group, social organization, preparedness for mission, duration of tour, types of tasks, physical and psychological isolation, personal motivation, perceived risk, and quality of habitat and life support conditions. One-hundred design recommendations concerning, sleep, clothing, exercise, medical support, personal hygiene, food preparation, group interaction, habitat aesthetics, outside communications, recreational opportunities, privacy and personal space, waste disposal, onboard training, simulation and task preparation, and behavioral and physiological requirements associated with a microgravity environment, are provided. Author

N88-26103# Stanford Linear Accelerator Center, CA.

INTRODUCTION TO HUMAN FACTORS

J. M. WINTERS Mar. 1988 10 p Presented at the SHARE

Conference, Anaheim, Calif., 28 Feb. 1988

(Contract DE-AC03-76SF-00515)

(DE88-009021; SU-SLAC-PUB-4561; CONF-880233-2) Avail: NTIS HC A02/MF A01

Some background is given on the field of human factors. The nature of problems with current human/computer interfaces is discussed, some costs are identified, ideal attributes of graceful system interfaces are outlined, and some reasons are indicated why it's not easy to fix the problems. DOE

N88-26263# Department of Energy, Washington, DC. Office of Program Analysis

PROCEDURES FOR PEER REVIEW ASSESSMENTS

1988 31 p

(DE88-007749; DOE/ER-0357) Avail: NTIS HC A03/MF A01

The Office of Program Analysis (OPA) conducts peer reviews of DOE research and development programs. The reviews are performed by examining individual projects which comprise the

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programs and assess the quality of the research, quality of the research team, productivity, and mission relevance for each project reviewed. DOE

N88-27967# Engineering Research Associates, Inc., Vienna, VA.

RULES, SCHEMA AND DECISION MAKING Interim Report
DAVID NOBLE, CARLA GROSZ, and DEBORAH BOEHM-DAVIS
Sep. 1987 91 p
(Contract N00014-84-C-0484)
(AD-A193389; R-125-87) Avail: NTIS HC A05/MF A01 CSDL
05H

The development and use of schemata in decision making is examined. Subjects are trained to evaluate alternatives by calculating expected outcomes. In subsequent tests, subjects are required to select the best alternative without being given enough time to compute outcomes. Under these conditions subjects adopted a hybrid decision strategy employing both schemata and approximations to outcome calculation. The schemata were organized around a prototype. They specify a judgement associated with the prototype and also contain feature oriented data useful for accommodating differences between observed situations and the situation prototype. There was no evidence for other memory reference structures examined. These included indicator/counter/indicator features and wholistic schemata that could entirely replace the learned outcome calculation procedure. There was also no support for memory structures that define discriminator boundaries between different types of judgements or decisions. GRA

N88-29287# Human Resources Research Organization, Alexandria, VA.

LITERATURE REVIEW: VALIDITY AND POTENTIAL USEFULNESS OF PSYCHOMOTOR ABILITY TESTS FOR PERSONNEL SELECTION AND CLASSIFICATION

JEFFREY J. MCHENRY and SHARON R. ROSE Apr. 1988
254 p Prepared in cooperation with Personnel Decisions Research Inst., Minneapolis, Minn.
(Contract MDA903-82-C-0531; DA PROJ. 2Q2-63731-A-792)
(AD-A193558; ARI-RN-88-13) Avail: NTIS HC A12/MF A01
CSDL 14B

The psychomotor ability literature was reviewed to determine the validity and potential usefulness of psychomotor ability tests for personnel selection and classification. Over 2,200 psychomotor test validity coefficients were located. These were tabulated by ability (using Fleishman's psychomotor ability taxonomy), criterion (e.g., school vs. training vs. job performance), and job type. Analyses of these data showed that psychomotor tests had been used successfully to predict training and job performance for many different occupations. Barriers to the use of psychomotor tests were also investigated. Reliability data indicate that psychomotor measures are not unstable. Moreover, the possibility of using computerized tests in the future to assess psychomotor abilities should eradicate the problem of apparatus differences. GRA

02

MANAGEMENT THEORY AND TECHNIQUES

Includes Management Overviews and Methods, Decision Theory and Decision Making, Leadership, Organizational Structure and Analysis, Systems Approaches, Operations Research, Mathematical/Statistical Techniques, Modelling, Problem Solving, Management Planning.

A88-10366*# National Aeronautics and Space Administration, Washington, DC.

PREPARING FOR THE FUTURE

ANDREW J. STOFAN (NASA, Washington, DC) Aerospace America (ISSN 0740-722X), vol. 25, Sept. 1987, p. 16-18, 20, 22.

Technologies and programs related to the development, construction, and operation of the Space Station are examined. A phase approach has been chosen for the construction of the Space Station, which is to have a revised baseline configuration. Consideration is given to the use of automation on the Space Station; the assembly and servicing of the Station; user requirements; and Space Station operations. The benefits the Space Station will provide to space exploration are discussed. I.F.

A88-10401

BUILDING HIGH PERFORMING ENGINEERING PROJECT TEAMS

HANS J. THAMHAIN (Bentley College, Waltham, MA) and DAVID L. WILEMON (Syracuse University, NY) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. EM-34, Aug. 1987, p. 130-137. refs

This article summarizes four years of research into the drivers and barriers of effective teambuilding in engineering work environments. A simple input-output model is presented for organizing and analyzing the various factors which influence team performance. The field survey results supported by correlation analysis indicate that team performance is primarily associated with six driving forces and six barriers which are related to: leadership, job content, personal needs, and general work environment. Specific recommendations are made. Author

A88-10402

CHARACTERISTICS OF R&D MANAGEMENT WHICH INFLUENCE INFORMATION NEEDS

ROBERT G. BATSON (Alabama, University, Tuscaloosa) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. EM-34, Aug. 1987, p. 178-183. refs

The information needs of mid- and upper-level R&D managers are identified by reviewing their environment, functions, and communication patterns from an information systems perspective. The information problems in R&D, such as inability to respond rapidly and failure of analytical support methods, are seen as symptoms of the mismatch of information needs and the information systems employed. The new technology of decision support systems is discussed as the ideal solution approach to R&D information management and decision-making. A comprehensive list of candidate data bases is provided. Author

A88-15810*# National Aeronautics and Space Administration, Washington, DC.

INTERNATIONAL SPACE STATION OPERATIONS: NEW DIMENSIONS - OCTOBER 13, 1987

GRANVILLE E. PAULES, PETER LYMAN, and CARL B. SHELLEY (NASA, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 17 p. (IAF PAPER 87-13)

One of the principal goals of the participants in the International Space Station program is to provide a management support structure which is equitable and fair to all participants, responsive to the needs of users, responsible to other partners, and mutually supportive to the participation of other partners. Shared-utilization, shared-cost, and shared-operations policies considerations are discussed. Special attention is given to the methodology for identifying costs and benefits of this program, in which each partner should be provided with benefits in proportion to his contribution, and no partner would be forced to share in cost the inefficiencies introduced by other partners. The Space Station hierarchy of operations functions are identified, and the recommended framework planning and control hierarchy is presented. I.S.

A88-15843*# National Aeronautics and Space Administration, Washington, DC.

NASA AND THE SPACE STATION - CURRENT STATUS

THOMAS L. MOSER (NASA, Office of Space Station, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. (IAF PAPER 87-64)

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In the baseline configuration of the Space Station, NASA engineers have provided for a range of modifications that will enlarge the capabilities available to future users. An extensive definition and design study has been completed which is supplemented by a critical evaluation of the Space Station configuration; a three-year technology-development effort has also drawn to a close which examined operational factors and restructured program management responsibilities. Costs have been estimated on the basis of the revised configuration in order to insure full consistency for program funding plans. O.C.

A88-15870*# McDonnell-Douglas Astronautics Co., Huntington Beach, CA.

SPACE STATION SERVICES AND DESIGN FEATURES FOR USERS

PETER R. KURZHALS and ROYCE L. MCKINNEY (McDonnell Douglas Astronautics Co., Space Station Div., Huntington Beach, CA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 11 p. (Contract NAS9-17367) (IAF PAPER 87-99)

The operational design features and services planned for the NASA Space Station will furnish, in addition to novel opportunities and facilities, lower costs through interface standardization and automation and faster access by means of computer-aided integration and control processes. By furnishing a basis for large-scale space exploitation, the Space Station will possess industrial production and operational services capabilities that may be used by the private sector for commercial ventures; it could also ultimately support lunar and planetary exploration spacecraft assembly and launch facilities. O.C.

A88-15928*# National Aeronautics and Space Administration, Washington, DC.

SPACE LAUNCH SYSTEMS - CURRENT UNITED STATES PLANS AND THE NEXT LOGICAL STEPS THROUGH 2000

DARRELL R. BRANSCOME (NASA, Office of Space Flight, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. (IAF PAPER 87-187)

The United States space transportation plans are discussed with emphasis on returning the Titan and the Shuttle to operational status. In particular, Shuttle enhancements via advanced solid rocket boosters and replacement of solid rocket boosters by liquid rocket boosters are examined. The Shuttle-C vehicle is then discussed as the next logical step that could provide a heavy launch capability in the early 1990s. The Shuttle-C will provide assured and flexible access to space for large Centaur-class payloads, for Space Station assembly, and for planetary missions. V.L.

A88-16243*# National Aeronautics and Space Administration, Washington, DC.

LONG RANGE PLANNING AT NASA

IVAN BEKEY (NASA, Program Planning, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. (IAF PAPER 87-670)

NASA's current plans for the U.S. space program are described. Consideration is given to the debate between manned or unmanned exploration of space, missions to the moon versus missions to Mars, and the exploration of space applications or science. NASA has created the Office of Policy and Planning and the Office of Exploration in order to improve the planning of future space activities. Long-range trends such as second-generation Shuttles, cargo launch vehicles with large capacity systems, an advanced Space Station, the use of robotics, closed cycle life support, health maintenance techniques, and the processing of extraterrestrial materials are considered. I.F.

A88-16244# **THE EUROPEAN LONG-TERM SPACE PLAN**

KARL-EGON REUTER (ESA, Coordination and Monitoring Office,

Paris, France) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 16 p. (IAF PAPER 87-671)

ESA's Long-Term Space Plan encompasses as its infrastructural components the Columbus Space Station, the Ariane 5 launch vehicle, and the Hermes reusable orbiter; these are further supported by the Data Relay satellite. In the coming years, this infrastructure will be applied to an Earth Observation Program, a Microgravity Research Program, and a Telecommunications Program. Additional accounts are given of plans for an expansion of ground station infrastructure, scheduling and funding considerations, an industrial support policy for these expanded space efforts, and the management of cooperative ventures with the U.S. O.C.

A88-21568

EARTH OBSERVATION AND THE SPACE STATION

DAVID L. CROOM (British National Space Centre, London; SERC, Rutherford Appleton Laboratory, Didcot, England) (Columbus II; Proceedings of the Second Workshop, Hanover, Federal Republic of Germany, June 9-11, 1986) Space Technology - Industrial and Commercial Applications (ISSN 0277-4488), vol. 7, no. 1-2, 1987, p. 143-147.

The organization, objectives, and preliminary results of U.S. and European planning studies on terrestrial remote sensing from the International Space Station are briefly reviewed. Consideration is given to the NOAA-NASA Earth Observation System program, the UK Columbus Utilization Core Group, the Anglo-French Columbus Polar Platform Utilization Working Group, and the ESA Polar Orbiting Platform Group. A number of specific recommendations by these groups are presented, and the need for broad-based international cooperation on the spacecraft, payload, data-management, and institutional levels of the Columbus Polar Platform program is stressed. T.K.

A88-21573 National Aeronautics and Space Administration, Washington, DC.

INTERNATIONAL COOPERATION IN THE SPACE STATION

WILLIAM P. RANEY (NASA, Utilization and Performance Requirements Div., Washington, DC) (Columbus II; Proceedings of the Second Workshop, Hanover, Federal Republic of Germany, June 9-11, 1986) Space Technology - Industrial and Commercial Applications (ISSN 0277-4488), vol. 7, no. 1-2, 1987, p. 171-173.

The principles and policies governing participation in the International Space Station are examined from a NASA perspective. The history of the program is reviewed; the most important aspects of the partnership concept (functional allocation, shared access, and interface commonality) are considered in detail; and the ongoing outfitting studies are briefly characterized. Major issues remaining to be negotiated include (1) the overall management structure; (2) the division of responsibilities for system design, integration, operation, and utilization; and (3) the sharing of operating costs. T.K.

A88-21575

PARTNERSHIP, A KEY ISSUE IN THE INTERNATIONAL SPACE STATION COOPERATION

MARIO DE LEO (Ministero per il Coordinamento della Ricerca Scientifica e Tecnologica, Rome, Italy) (Columbus II; Proceedings of the Second Workshop, Hanover, Federal Republic of Germany, June 9-11, 1986) Space Technology - Industrial and Commercial Applications (ISSN 0277-4488), vol. 7, no. 1-2, 1987, p. 185-189.

The organizational approach to be followed in implementing the ESA Columbus program for participation in the International Space Station is examined. The recent history of ESA-NASA negotiations is traced, and the present Columbus reference configuration is described. Possible organizational structures are presented in a series of block diagrams and briefly characterized. T.K.

A88-22044*# Martin Marietta Corp., Denver, CO.

HUMAN EXPLORATION OF MARS

BENTON C. CLARK (Martin Marietta Planetary Sciences

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Laboratory, Denver, CO) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 6 p. refs
(Contract NAS8-37126)
(AIAA PAPER 88-0064)

A systems study is underway of astronaut missions to Mars that could be accomplished over the next four decades. In addition to an emphasis on the transportation and facility infrastructure required for such missions, other relevant technologies and mission constraints are also being considered. These induce on-orbit assembly, trajectory type, launch opportunities, propellant storage, crew size, cabin pressure, artificial gravity, life-support systems, radiation hazards, power/energy storage, thermal control, human factors, communications, abort scenarios, landing techniques, exploration strategies, and science activities. A major objective of the study is to identify enabling and significantly enhancing technologies for accomplishing the goal of the human exploration of Mars.
Author

A88-22567# SPACEWARD HO

JOHN F. YARDLEY (McDonnell Douglas Astronautics Co., Saint Louis, MO) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 7 p.
(AIAA PAPER 88-0750)

The paper compares the differences between the U.S. and Soviet space programs in the past 30 years to determine what steps the U.S. can take to regain its leadership position in space. After briefly examining the space flight technology and the development processes utilized by the two space programs, it is suggested that the U.S. become more evolutionary in its programs and more streamlined in its development practices. Most important, however, is the gaining of public support for a robust, long-range space plan. The key is effective communication with the American people; it is suggested that the AIAA take the lead in organizing this communication thrust.
Author

A88-22628* European Space Agency. European Space Operations Center, Darmstadt (Germany, F.R.).

OPERATION OF A MULTI-YEAR, MULTI-AGENCY PROJECT

JUERGEN FAELKER (ESA, European Space Operations Centre, Darmstadt, Federal Republic of Germany), FREDERICK GORDON (NASA, Goddard Space Flight Center, Greenbelt, MD), and MICHAEL C. W. SANDFORD (SERC, London, England) IN: Exploring the universe with the IUE satellite. Dordrecht, D. Reidel Publishing Co., 1987, p. 21-42.

Organizational and technological aspects of the operation by NASA and ESA of the IUE satellite observatory since its launch in 1978 are discussed. Topics addressed include the division of responsibilities among the ground stations, the IUE orbit and its evolution, the IUE spacecraft, normal operations (proposal selection and observation planning, shift handover, and spacecraft operations), and a typical observation (target identification and acquisition, telescope focus, spectrograph modes, camera operations, calibration, and data reduction). Consideration is given to constraints on IUE operation due to the sun-earth-moon configuration (eclipses), spacecraft power, radiation, temperature, and momentum-wheel speed; problems encountered with gyros, onboard computers, the fine sun sensor, and cameras; and the reliable high-efficiency overall performance of the IUE. Diagrams, drawings, and graphs are provided.
T.K.

A88-22992 ALLOTMENT PLANNING FOR TELECOMMUNICATION SATELLITES

MILTON L. SMITH (USAF, Space Command, Peterson AFB, CO) Space Communication and Broadcasting (ISSN 0167-9368), vol. 5, Nov. 1987, p. 359-364. refs

This article examines one of the most critical issues that must be resolved at the 1988 Space World Administrative Radio Conference (WARC): the definition of the Allotment Plan for telecommunication satellites. It reviews the results of the 1985 Space WARC, and then focuses on the Allotment Plan called for by that session. As the 1985 Space WARC closed, the fundamental

nature of the Allotment Plan remained undefined. Some nations considered that it should be an a priori-type plan, characterized by rights to a specific orbital position for each country that would be assigned when the plan was devised. Other nations maintained that it should be a more flexible plan characterized by rights to a position somewhere within an allotted predetermined orbital arc, with a specific position to be assigned only when a satellite system is to be implemented. The article concludes that a plan emphasizing predetermined arcs can provide a realistic and continuing guarantee of equitable access, as well as many other benefits that an a priori plan cannot provide. This conclusion is supported by a review of the computer software being used by the ITU for intersessional planning exercises which should validate the advantages of a predetermined arc concept.
Author

A88-23867 SO YOU THINK YOU KNOW WHERE YOU ARE? A REVIEW OF SOME TECHNIQUES USED IN EVALUATING AND PREDICTING DEVELOPMENT SCHEDULES

LEE R. BALHAZOR (Portsmouth Business School, England) IN: Development time scales: Their estimation and control; Proceedings of the Symposium, London, England, Feb. 12, 1987. London, Royal Aeronautical Society, 1987, p. 105-133. refs

The paper first considers the requirements of managers planning and controlling development projects. Various techniques are examined in conjunction with these requirements. The conclusion is drawn that many of the simpler techniques in use can be very misleading. An improvement in understanding and accuracy may be achieved if the simple presentations are supported by detailed and more complex analyses which are becoming readily available with advances in information technology.
Author

A88-23868 EXPERIENCES OF PROGRAMME PLANNING AND MANAGEMENT FROM THE CUSTOMER'S VIEWPOINT

C. J. U. ROBERTS (Ministry of Defence Procurement Executive, London, England) IN: Development time scales: Their estimation and control; Proceedings of the Symposium, London, England, Feb. 12, 1987. London, Royal Aeronautical Society, 1987, p. 134-139.

The methodology of Technology Demonstrator Programs (TDPs) is presently suggested to be capable of making major contributions to controlling the costs and time-scales associated with high technology, defense-related projects. TDPs yield a quantity and quality of knowledge, and an infrastructural resource, that can help in the formation of effective design and management teams when the same technology is applied in subsequent weapon system development projects. It is noted that if a TDP is launched too early, the technology used may not be relevant to subsequent projects; if too late, the technology development effort involved may prove irrelevant.
O.C.

A88-24197 TELECONFERENCING-FROM-THE-COLLEGE-CLASSROOM - SPACE DEVELOPMENT, GLOBAL PROBLEMS AND EDUCATIONAL MOTIVATION

HOWARD I. THORSHEIM (Saint Olaf College, Northfield, MN) Space Technology - Industrial and Commercial Applications (ISSN 0277-4488), vol. 7, no. 3, 1987, p. 235-242. refs

A88-28590 UNCERTAINTY MANAGEMENT TECHNIQUES IN ADAPTIVE CONTROL

HAGOP V. PANOSSIAN (HR Textron, Inc., Valencia, CA) IN: System identification and adaptive control. Part 1. Orlando, FL, Academic Press, Inc., 1987, p. 1-53. refs

The optimization and control of stochastic dynamic systems under conditions of uncertainty require that the decision-making process take into account the possibility of feedback, as well as the risk involved. The stochastic formulation presented, with either time-dependent or constant parameters, allows the simultaneous treatment of several important classes of problems, such as stochastic adaptive control, control of finite-state Markov chains,

and aerospace systems and macroeconomic control. Attention is given to a framework for optimization and control of linear discrete time multidimensional stochastic systems under partial information conditions. O.C.

A88-30675**SYSTEMS AND THEIR MANAGEMENT**

TOM N. CORKILL (British Aerospace, PLC, London, England) Aerospace Dynamics (ISSN 0263-2012), no. 23, 1988, p. 23, 24.

The application of systems-management (SM) techniques to product design and development in the aerospace industry is briefly considered. The increasing complexity of aerospace hardware and weapon systems and the need to strictly limit development costs are pointed out, and their impact on management problems is indicated. SM is defined as the management, on terms agreed to with the customer, of all technical events leading from the conception of a product to its realization and use by the customer. SM includes setting technical objectives for the total system and its subsystems and monitoring their achievement. The role of SM is seen as complementary to that of project management, which has a more limited scope centered on costs and scheduling.

T.K.

A88-30835**AN OVERVIEW OF MATERIALS PROCESSING IN SPACE**

HARVEY J. WILLENBERG (Boeing Aerospace Co., Huntsville, AL) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 5-8, 1987. 7 p. (SAE PAPER 871891)

An overview is given of the physical phenomena that are affected by the gravitational environment found in low earth orbit. These phenomena are related to specific classes of materials that may benefit from microgravity processing, including biotechnological materials, semiconductors and crystals, metals and alloys, polymers, glasses, and fundamental fluid dynamic research. Examples are given of experimental results and potential applications for commercial development. The growth of commercial interest in microgravity processing within the United States is reviewed, with projections of future development scenarios. The status of domestic and international programs is summarized, including an overview of Japanese and European Spacelab and Soviet Salyut and Mir research. The role of Space Shuttle systems and plans for a materials laboratory on the Space Station is described. Author

A88-38710#**SKUNK WORKS PROTOTYPING**

HAROLD C. FARLEY and RICHARD ABRAMS (Lockheed Aeronautical Systems Co., Burbank, CA) IN: AIAA Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 72-84. (AIAA PAPER 88-2094)

This paper discusses the Skunk Works' management approach to prototype development programs. A historical perspective of different types of prototype programs is presented along with descriptions of some of the more notable Skunk Works' prototypes. The paper then highlights the Company's preferred system of management along with important factors to be considered in the planning and conduct of a prototype program. Author

A88-39594**KNOWLEDGE-BASED PLANNING AND REPLANNING IN NAVAL COMMAND AND CONTROL**

J. A. GADSDEN (Admiralty Research Establishment, Portsmouth, England) IN: Conference on Artificial Intelligence Applications, 4th, San Diego, CA, Mar. 14-18, 1988, Proceedings. Washington, DC, IEEE Computer Society Press, 1988, p. 286-292. refs

A description is given of the progress of a research program that is addressing the application of knowledge-based techniques to resource planning and replanning for naval command and control. The domain of resource planning in this context is defined together with some specific examples. The reasons for a

knowledge-based approach are outlined and the results of the three-year research program are reported. Finally, future research is described, together with a discussion of some of the problems that will arise in the development of knowledge-based decision-support systems for operational use. I.E.

A88-42964#**THE CAPTAIN'S MANAGERIAL TASKS**

ANDRE DROOG (Psychotechniek, Utrecht, Netherlands) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 372-378. refs

The roles which a captain has as leader of an air crew are analyzed and compared with the Mintzberg (1973) model for managerial work. Interpersonal, communication, and decisional roles are discussed. The managerial characteristics presented include work at an unrelenting pace, the performance of various brief and fragmented activities, preference for live action, attraction to the verbal media, use of a network of contacts outside his organization, and a blend of rights and duties. It is found that many characteristics of a manager are similar to those of a captain, with those of leader, monitor, disseminator, resource allocator, and disturbance handler being the most important. R.B.

A88-42970#**COCKPIT RESOURCE MANAGEMENT - NEW DEVELOPMENTS AND TECHNIQUES**

WILLIAM R. TAGGART (Cockpit Resource Management, Austin, TX) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 433-439.

A model for developing a cockpit resource management (CRM) training design is presented. Issues pertaining to the design and implementation of CRM training are addressed. The key elements identified in the development of the CRM concept are initiative, inquiry, advocacy, conflict resolution, decision making, and critique. K.K.

A88-43006#**A METHODOLOGICAL APPROACH TO THE SEARCH FOR INDIRECT (HUMAN) EVENTS RELATED TO MISHAPS**

KINGSLEY M. HENDRICK (Transportation Safety Institute, Oklahoma City, OK), LUDWIG BENNER, JR. (Events Analysis, Inc., Oakton, VA), and RUSSELL LAWTON (AOPA Air Safety Foundation, Frederick, MD) IN: International Symposium on Aviation Psychology, 4th, Columbus, OH, Apr. 27-30, 1987, Proceedings. Columbus, OH, Ohio State University, 1987, p. 753-760. refs

The application of sequentially timed events plotting (STEP), a disciplining methodology based on multilinear events sequencing to document and display human decision events associated with accidents to improve decision making in aviation is discussed. The STEP methodology can document the recurrence of specific decision making events and can assist the development of hypotheses from observation and documentation. Hypotheses generated using the methodology call for careful examination of concrete observations of events rather than abstract conclusions about phenomena. The DECIDE decision making model, developed for hazardous material transportation, was modified during refinement of the STEP methodology and was applied to the pilot decision making process. R.B.

A88-47907**ASTRODYNAMICS PROBLEMS OF THE SPACE STATION**

J.-P. MAREC, P. BAINUM, J. V. BREAKWELL, C. MARCHAL, V. J. MODI (IAF, Paris, France) et al. Acta Astronautica (ISSN 0094-5765), vol. 17, May 1988, p. 491-494.

The preliminary views of the IAF Astrodynamics Committee on the astrodynamics problems related to the Space Station concept are presented. A brief description of the Space Station system and of its original features is given. Some astrodynamics problems are considered in more detail, concerning attitude motion (modeling,

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attitude determination and control, and tether applications) and orbital motion (transfer, docking, navigation/positioning/guidance, collision hazards, and data links). Author

A88-51133

SPACE FOR RENT?

ANDREW LAWLER Space World (ISSN 0038-6332), vol. Y-9-297, Sept. 1988, p. 15-19.

Plans to build an industrial space facility which would consist of a manned, free-flying platform and would be serviced by the Shuttle are discussed. The plan was sponsored by the Space Industries Partnerships, made up of several private aerospace companies. Efforts to gain governmental support for the project are examined, and the possibilities for the future of the plan are considered. R.B.

A88-51978#

WRIGHT BROTHERS LECTURESHIP IN AERONAUTICS: THE SKUNK WORKS' MANAGEMENT STYLE - IT'S NO SECRET

BEN R. RICH (Lockheed Aeronautical Systems Co., Burbank, CA) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 10 p. (AIAA PAPER 88-4516)

An historical development and organizational-principles account is presented for the 'Skunk Works' management philosophy created at the Lockheed Aeronautical Systems Company by Clarence 'Kelly' Johnson, beginning in 1943, in order to tightly organize and expedite small, highly-classified advanced aircraft design and prototype construction projects. This management philosophy has produced such aircraft as the U-2 and SR-71 spy aircraft and the P-80 and F-104 fighters. The 14 management principles formulated by Johnson are presented and discussed. O.C.

A88-53694

AN INTERACTIVE APPROACH TO R&D PROJECT SELECTION AND TERMINATION

JONATHAN F. BARD (Texas, University, Austin), RAMAIIYA BALACHANDRA (Northeastern University, Boston, MA), and PEDRO E. KAUFMANN (Portable Solutions, Austin, TX) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, Aug. 1988, p. 139-146. refs

A decision support tool is developed that can be used by the R&D manager to effectively update his or her portfolio when a review is called for. The approach is interactive and builds on two sets of critical factors. Initially, projects are screened to see if they are at an acceptable level, and if they are making reasonable progress toward completion. Those failing the test are terminated, those remaining are weighed with candidate projects to determine which should be included in the portfolio. This is achieved with a mathematical programming routine that maximizes expected returns. A case study centering on a peripheral equipment manufacturer is presented to demonstrate the methodology. I.E.

N88-10072*# National Aeronautics and Space Administration, Washington, DC.

SPACE STATION: LEADERSHIP FOR THE FUTURE

FRANKLIN D. MARTIN and TERENCE T. FINN 1987 10 p
Original contains color illustrations
(NASA-PAM-509/8-87) Avail: NTIS HC A02/MF A01 CSCL 22B

No longer limited to occasional spectacles, space has become an essential, almost commonplace dimension of national life. Among other things, space is an arena of competition with our allies and adversaries, a place of business, a field of research, and an avenue of cooperation with our allies. The space station will play a critical role in each of these endeavors. Perhaps the most significant feature of the space station, essential to its utility for science, commerce, and technology, is the permanent nature of its crew. The space station will build upon the tradition of employing new capabilities to explore further and question deeper, and by providing a permanent presence, the station should significantly increase the opportunities for conducting research in space. Economic productivity is, in part, a function of technical

innovation. A major thrust of the station design effort is devoted to enhancing performance through advanced technology. The space station represents the commitment of the United States to a future in space. Perhaps most importantly, as recovery from the loss of Challenger and its crew continues, the space station symbolizes the national determination to remain undeterred by tragedy and to continue exploring the frontiers of space. B.G.

N88-10685# Sandia National Labs., Albuquerque, NM. DOCUMENTATION AS A MANAGEMENT STRATEGY FOR REACHING GOALS IN HIGH-RISK RESEARCH-ORIENTED PROJECTS

C. G. SHIRLEY 1987 12 p Presented at the Project Management Institute Seminar/Symposium, Milwaukee, Wis., 2 Oct. 1987 (Contract DE-AC04-76DP-00789) (DE87-012394; SAND-86-2829C; CONF-8710103-2) Avail: NTIS HC A03

The paper reports experience bearing especially on construction projects in an R and D environment. From experience has come a set of principles about the key purposes of documentation. The paper first describes characteristics of a project environment that combines research and construction, then goes on to discuss basic project management goals that documentation can help the manager reach. The final sections present some specifics of documentation that may assist project managers who are considering what kind of documentation their projects need. DOE

N88-16118# Joint Publications Research Service, Arlington, VA. ADVANTAGES OF MANNED LUNAR BASE

V. V. SHEVCHENKO *In its* JPRS Report: Science and Technology. USSR: Space p 145-156 24 Nov. 1987 Transl. into ENGLISH from Zemlya i Vseennaya (Moscow, USSR), no. 2, Mar. - Apr. 1987 p 60-68
Avail: NTIS HC A08/MF A01

The Soviet Union has submitted to the member states of the UN a stage-by-stage program for joint operations in the peaceful development of space. The program goes up to the year 2000. It is suggested that conditions be created during that period of time that will enable the practical development and use of the Moon to begin as early as the first decades of the 21st century, with lunar settlements used as a base for flights to other planets. This would signify the creation of the actual prerequisites for Earth's civilization becoming, at the very beginning of the third millennium, an interplanetary civilization. The advantages of lunar bases for space exploration is examined. Author

N88-17250*# Rome Air Development Center, Griffiss AFB, NY. ADVANCED DECISION AIDING TECHNIQUES APPLICABLE TO SPACE

ROBERT J. KRUCHTEN *In* NASA. Lyndon B. Johnson Space Center, Houston, Texas, First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 321-326 Oct. 1987
Avail: NTIS HC A23/MF A01 CSCL 09B

RADC has had an intensive program to show the feasibility of applying advanced technology to Air Force decision aiding situations. Some aspects of the program, such as Satellite Autonomy, are directly applicable to space systems. For example, RADC has shown the feasibility of decision aids that combine the advantages of laser disks and computer generated graphics; decision aids that interface object-oriented programs with expert systems; decision aids that solve path optimization problems; etc. Some of the key techniques that could be used in space applications are reviewed. Current applications are reviewed along with their advantages and disadvantages, and examples are given of possible space applications. The emphasis is to share RADC experience in decision aiding techniques. Author

N88-17690# Moreton Hall Associates, Maidenhead (England). STUDY FOR HISTORY OF TECHNOLOGY DEVELOPMENTS IN EUROPEAN SPACE PROJECTS

G. E. HALL, comp. and R. D. HUNT, comp. (Spur Electron Ltd.,

Havant, England) Paris, France ESA Feb. 1987 47 p
(Contract ESA-6361/85-NL-PP(SC))
(REPT-8518-1; ESA-CR(P)-2511; ETN-88-91706) Avail: NTIS HC
A03/MF A01

The technologies used in European spacecraft from 1965 to 1986 were reviewed, and 890 ESRO/ESA contracts for the period were examined. A unique technology development model to which all investigated technologies conform is identified. Of three main technology decision-making criteria (technical, cost, and industrial policy), much evidence of industrial policy shows up. Analysis of utilization decisions highlights a reluctance to use newly developed technology because of conservatism among spacecraft design decision makers. Technologies started to satisfy a project need show a much better utilization picture than those begun for R and D reasons. Technologies utilized performed well in orbit. Monitoring of funding and planning effectiveness is hampered by the lack of firm, documented planning data and its limited availability time span. ESA

N88-17713# National Defense Univ., Washington, DC.

AMERICA PLANS FOR SPACE

1986 201 p
(AD-A187465) Avail: NTIS HC A10/MF A01 CSDL 22A

A report on America's future plans for space exploration contains the following: Pursuing a Balanced Space Program; The Space Defense Initiative; Warfare in Space; The Lunar Laboratory; The Role of Space in Preserving the Peace; Living off the Land-the Use of Resources in Space for Future Civilian Space Operations; The Military Uses of Space; C3I(Command Control Communications and Intelligence); Aspects of Space Technology; Arms Control in Space: Preserving Critical Strategic Space Systems Without Weapons in Space; Space and Arms Control: A Skeptical View; Options for Space Arms Control; Space Arms Control. GRA

N88-18517*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

NETWORKING REQUIREMENTS AND FUTURE ALTERNATIVES

ALISON BROWN, A. FREDRICK FATH, JOHN FITZGERALD, PHILIP GROSS, DENNIS HALL, JACK HAVERTY, CHARLES M. KENNEDY (Ballistic Research Labs., Aberdeen Proving Ground, Md.), THOMAS LASINSKI, FRED MCCLAIN, PATRICK MCGREGOR et al. Jun. 1987 18 p
(Contract DE-AC03-76SF-00098; W-7405-ENG-48; DE-AC02-76CH-03000)
(NASA-TM-89711; NAS 1.15:89711; DE88-000465; LBL-23656; CONF-870277-2) Avail: NTIS HC A03/MF A01 CSDL 12B

The Working Group on Networking Requirements and Future Alternatives recommends creation of an international, interagency networking facility for science, whose 15-year mission is to ensure that US scientists have available the most advanced wide area networking facilities in the world, and to ensure that US wide area network technology maintains a position of world leadership. A minimum of 1.5 Mbit/s access to major government and academic research centers should be provided. Such a network would greatly benefit the competitive position of the United States in scientific research. It would also place the US in a leadership position in utilization of high bandwidth, wide area networks. United States industries supporting wide area network technologies would gain a significant competitive advantage over the other countries. An ongoing program of research and development into both wide area network technology and network management is necessary for this endeavor to be successful. As part of the second year study, the Working Group recommends that an interagency coordinating committee be established to identify short-term implementation issues that can be investigated and resolved in parallel with long-term issues. This would provide immediate benefit to the nation's scientific community. DOE

N88-19362# Council of Scientific and Industrial Research, New Delhi (India).
SCIENCE AND TECHNOLOGY IN INDIA Status Report, 1986

Nov. 1986 90 p
(PB88-134747) Avail: NTIS HC A05/MF A01 CSDL 05A

The Government of India is the chief patron of science and technology in the country. The central governmental structure for scientific research and development is given in a separate section. Important policy measures taken since the previous status report was prepared (1982), an overview of S and T in the Sixth Five-Year Plan (1980 to 1985), and the main thrust of the current (seventh) Five-Year Plan (1985 to 1990) and its S and T components are given in sections that follow, which also deal with the functions of the various department/agencies under the Central Government and some recent highlights of their work, agency-wise. The rest of the sections deal with some salient aspects of the S and T scene in the country, with some statistics wherever available. Also included is a short list of institutions engaged in S and T research and related activities. GRA

N88-19483# Army Construction Engineering Research Lab., Champaign, IL.

STATE-OF-THE-ART TECHNOLOGIES FOR CONSTRUCTION IN SPACE: A REVIEW Final Report

CHARLES C. LOZAR and L. D. STEPHENSON Sep. 1987 88 p
(Contract MIPR-W31RPD-7-D4099; DA PROJ. 4A1-62731-AT-41)
(AD-A188412; CERL-TR-M-87/17) Avail: NTIS HC A05/MF A01 CSDL 22B

Future exploration and enterprise in low-Earth orbit will most likely require space stations for support. In addition, promotion of the Strategic Defense Initiative (SDI) is mandating research and development (R and D) into technologies for building structures to serve military objectives in space. However, an assessment of the state of the art for space construction technology has revealed that the field is immature, with little conceptual and experimental research completed. The U.S. Army Construction Engineering Research Laboratory (USA-CERL) has collected information on existing technologies for possible application in designing large space structures (LSS) for military support. This work is part of an effort by the U.S. Army Corps of Engineers (USACE) to ensure mission-responsiveness in anticipation of a role in space construction. USA-CERL is USACE's designated lead laboratory for this program. Military structures will require design criteria much different from those of experimental space stations. Proposed conceptual criteria for both types structures are compared and differences are noted. Much R and D is needed before any of these structures can be deployed in space. GRA

N88-20204# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

TASK ALLOCATION FOR EFFICIENT PERFORMANCE OF A DECENTRALIZED ORGANIZATION

CHONGHWAN LEE Sep. 1987 138 p
(Contract N00014-85-K-0519)
(AD-A188699; LIDS-TH-1706) Avail: NTIS HC A07/MF A01 CSDL 05C

A task allocation scheme in an organization is discussed. The behavior of an organization is mathematically modeled by a decentralized gradient-like algorithm for additive cost functions. The objectives of allocation are reduction of individual load, speedy performance, and organizational security. The allocation scheme is sought for three types of organizations classified by the flexibility of their communication structure; namely, fixed organization, flexible organization, and semi-flexible organization. GRA

N88-20217# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Psychology.

TEXT ORGANIZATION AND COMPREHENSIBILITY IN TECHNICAL WRITING Interim Report, Aug. 1986 - Aug. 1987

DIANA DEE-LUCAS and JILL H. LARKIN Oct. 1987 17 p
(Contract MDA903-85-K-0180; DA PROJ. 2Q1-81102-B-74-F)
(AD-A188913; ARI-RN-87-52) Avail: NTIS HC A03/MF A01 CSDL 05G

Technical texts often introduce scientific principles by deriving the principle prior to stating it. This proof-first organization violates

02 MANAGEMENT THEORY AND TECHNIQUES

writing guidelines suggested by current text learning theories. The current research compares the effect on comprehension of this type of structure with its logical alternative a principle first structure. Results indicate that readers spend more time with information when it occurs first. Thus, the principle-first structure focuses attention on the principle, and the proof-first structure (not surprisingly) focuses attention on the proof. Additionally, readers find it easier to predict what is important in principle-first texts, and used the principle-first approach more often in summarizing. These findings indicate that readers find the information in a principle-first organization easier to process and store. Ongoing research is investigating differences in what readers learn using these two structures. GRA

N88-20826# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.

HUMAN PROBLEM SOLVING IN DYNAMIC ENVIRONMENTS. UNDERSTANDING AND SUPPORTING OPERATORS IN LARGE-SCALE, COMPLEX SYSTEMS Final Report, Jun. 1982 - Dec. 1986

RICHARD L. HENNEMAN and WILLIAM B. ROUSE Oct. 1987 75 p

(Contract MDA903-82-C-0145; DA PROJ. 2Q1-61102-B-74-F) (AD-A189539; ARI-RN-87-51) Avail: NTIS HC A04/MF A01 CSDL 05H

This research note seeks an empirical understanding of the relationship between the physical characteristics of a large-scale system and human performance and a formalization of empirical results into several measures of large scale complexity. Behavioral computer models of the human operator in a large-scale environment were then constructed, and the models were found consistent with human behavior. This approach showed subtle performance improvement for aided subjects. GRA

N88-21074*# Boeing Aerospace Co., Seattle, WA.
APPLICATION OF EXPERT SYSTEMS IN PROJECT MANAGEMENT DECISION AIDING Final Technical Report No. 2092

REGINA HARRIS, STEVEN SHAFFER, JAMES STOKES, and DAVID GOLDSTEIN Aug. 1987 122 p

(Contract NAS5-30040) (NASA-CR-180762; NAS 1.26:180762) Avail: NTIS HC A06/MF A01 CSDL 05A

The feasibility of developing an expert systems-based project management decision aid to enhance the performance of NASA project managers was assessed. The research effort included extensive literature reviews in the areas of project management, project management decision aiding, expert systems technology, and human-computer interface engineering. Literature reviews were augmented by focused interviews with NASA managers. Time estimation for project scheduling was identified as the target activity for decision augmentation, and a design was developed for an Integrated NASA System for Intelligent Time Estimation (INSITE). The proposed INSITE design was judged feasible with a low level of risk. A partial proof-of-concept experiment was performed and was successful. Specific conclusions drawn from the research and analyses are included. The INSITE concept is potentially applicable in any management sphere, commercial or government, where time estimation is required for project scheduling. As project scheduling is a nearly universal management activity, the range of possibilities is considerable. The INSITE concept also holds potential for enhancing other management tasks, especially in areas such as cost estimation, where estimation-by-analogy is already a proven method. Author

N88-21075# Allen Corp. of America, Alexandria, VA.
MANPRINT HANDBOOK FOR RFP (REQUEST FOR PROPOSAL) DEVELOPMENT Final Report, 30 Jun. 1986 - 15 Sep. 1987

JACOB L. BARBER, ROBERT E. JONES, JR., HARRY L. CHING, and JOHN L. MILES, JR. (Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.) 15 Sep. 1987 156 p

(Contract OPM-85-75)

(AD-A188321) Avail: NTIS HC A08/MF A01 CSDL 05A

This handbook is designed to assist personnel tasked with preparing a Request for Proposal (RFP) for any phase of a major system development program. It specifically focuses on how to include Manpower and Personnel Integration (MANPRINT) requirements in the RFP. The Handbook is organized into four chapters and an appendix section. Chapter 1, discusses the six domains that comprise MANPRINT and explains how the domains and their integrated products relate to the materiel acquisition process. Chapter 2, examines each of the six domains separately and identifies both documents and agencies that can provide assistance in RFP preparation. Chapter 3, identifies preceding events and activities that shape the structure and content of the MANPRINT requirements in the RFP. It describes the linkages that should exist and what can be done in the event critical MANPRINT elements are non-existent. Illustrative paragraphs as they should appear in the RFP are provided. Chapter 4, is a summation of activities described in Chapter 3. An RFP for a major notional Army weapon system with significant MANPRINT implications is presented. GRA

N88-21078# Office of the Under Secretary of Defense (Acquisitions), Washington, DC.

REPORT OF THE DEFENSE SCIENCE BOARD SUMMER STUDY ON TECHNOLOGY BASE MANAGEMENT

Aug. 1987 60 p

(AD-A188560) Avail: NTIS HC A04/MF A01 CSDL 05B

The 1987 Defense Science Board (DSB) Summer Study on Technology Base Management was charged with evaluating the management of the technology base of Department of Defense (DOD) and making recommendations on ways to improve the effectiveness and efficiency of the management process. The thrust of this study was to develop management principles that could guide the Technology Base rather than to develop a more detailed set of recommendations. The conclusions of the panel are derived from a qualitative evaluation of the present system coupled with an understanding of how well (or poorly) recommendations of past studies have been implemented. It was evident that implementation of any recommendations will face substantial institutional resistance and political difficulties. Accordingly the Study has, in some cases, adopted the mechanism of proposing a series of experiments or demonstrations of major change which point in the right direction. It is important to understand that the leadership and vision of motivated individuals and groups are a critical part of technical management. The study has been as concerned with this aspect of Technology Base management as with more institutional or bureaucratic processes. GRA

N88-23688# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.

EXTRACTING INFORMATION FROM PROBLEM SOLVING EXPERIENCE Interim Report, Jul. 1986 - Jun. 1987

JANET L. KOLODNER Dec. 1987 5 p

(Contract MDA903-86-C-0173; DA PROJ. 2Q1-61102-B-74-F) (AD-A191331; ARI-RN-87-81) Avail: NTIS HC A02/MF A01 CSDL 05H

Much of the problem solving which is performed involves consideration of previous similar situations. Access to previous experience keeps the problem solver from avoiding past mistakes, and aids in the derivation of shortcuts for reasoning. This document outlines the research studying the processes that comprise this problem solving style. Topics outlined include: organization of cases and generalized knowledge in memory, knowledge structures, the evolution of knowledge structures, analogical problem solving, and failure-driven learning. GRA

N88-25142# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.

HUMAN PROBLEM SOLVING IN COMPLEX DYNAMIC ENVIRONMENTS Interim Report, Jun. 1984 - May 1985

WILLIAM B. ROUSE and RICHARD L. HENNEMAN Dec. 1987 65 p

02 MANAGEMENT THEORY AND TECHNIQUES

(Contract MDA903-82-C-0145; DA PROJ. 2Q1-61102-B-74-F)
(AD-A190788; ARI-RN-87-84) Avail: NTIS HC A04/MF A01
CSCL 23B

This research note summarizes three years of a four year contract to study ways of improving human performance in highly integrated systems in such areas as communications, transportation, manufacturing, etc. Rule-based computer models of human performance (CAIN) are discussed, as are methods from measuring the complexity of the task of monitoring these large-scale systems. Finally, the development of a computer model (MABEL) which requires subjects to monitor a large-scale communications network is described. GRA

N88-25374# Pentagon Library, Washington, DC.
MANAGEMENT AND THE EXECUTIVE Final Report, 1 Jan. 1982 - 31 Dec. 1987
1 Jan. 1988 44 p
(AD-A190778) Avail: NTIS HC A03/MF A01 CSCL 05A

This bibliography lists books and periodical articles covering such topics as personnel management, corporate planning, decision-making, executive training, leadership, management information systems, and organizational behavior. In addition, it highlights some special interest areas: women executives, chief executive officers, job stress, and ethics. An index of management topics is appended to assist readers in finding related items. GRA

N88-25375# Northwest Regional Educational Lab., Portland, OR.
SELECTION AND EFFECTS OF CHANNELS IN DISTRIBUTED COMMUNICATION AND DECISION MAKING TASKS: A THEORETICAL REVIEW AND A PROPOSED RESEARCH PARADIGM Interim Report, May 1986 - May 1987
STEPHEN M. REDER and NANCY F. CONKLIN Feb. 1988 43 p
(Contract MDA903-86-C-0171; DA PROJ. 2Q1-61102-B-74-F)
(AD-A191807; ARI-RN-88-04) Avail: NTIS HC A03/MF A01 CSCL 05A

This research note examines the relationships between the communication patterns of decision groups and the nature and results of their decision processes. It looks at the selection of particular channels and channel effects, as well. A review of research indicates that no satisfactory theoretical framework has yet been developed which accounts for the often strategic and tactical nature of communication channel selection. An initial theory is outlined, establishing quantifiable relationships among causally linked sets of variables: 1) characteristics of the decision group (size, structure, and spatial dispersion), 2) characteristics of the decision task (nature of the decision, perceived organizational significance, time available, and available communication channels), 3) channel selection(s) made by the group, 4) structural and content characteristics of the messages produced, 5) decisions reached, and 6) perceived characteristics of the decision process. GRA

N88-26113# Du Pont de Nemours (E. I.) and Co., Aiken, SC.
IDEA PROCESSING FOR CREATIVITY AND MANAGEMENT
P. E. MILLER 1988 5 p Presented at the 35th Annual International Technical Communication Conference, Philadelphia, Pa., 10 May 1988
(Contract DE-AC09-76SR-00001)
(DE88-006110; DP-MS-87-163; CONF-880528-4) Avail: NTIS HC A02/MF A01

Tips and case histories on computer use for idea and outline processing are discussed. Productivity software to solve problems of idea hierarchy, transitions, and developments is matched to solutions for communicators. One case is text that ranges from methods and procedures to histories and legal definitions of classification for the US Department of Energy. Applications of value to writers, editors, and managers such as research, calendars, creativity, prioritization, idea discovery and manipulation, file and time management, and contents, indexes, and glossaries are also discussed. DOE

N88-26261# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.

COORDINATION IN DECISION-MAKING ORGANIZATIONS
JEAN-LOUIS M. GREVET and ALEXANDER H. LEVIS Jan. 1988 28 p
(Contract N00014-84-K-0519)
(AD-A191952; LIDS-P-1738) Avail: NTIS HC A03/MF A01 CSCL 05A

A methodology to analyze, model, and evaluate decision-making processes that require coordination is presented. The issues of inconsistency of information and synchronization are emphasized. Predicate Transition Nets are used as the basic technique for representing organizational structures and for characterizing the coordination of processes. Protocols of interaction are modeled by transitions for which the rule of enablement is that the decisionmakers, when interacting, must refer to the same state of the environment. Two measures of coordination are then introduced: The degree of information consistency and the measure of synchronization. These measures are defined on the basis of the attributes of the tokens belonging to the input places of transitions modeling interactions. A recently developed simulation system for Predicate Transition Nets is used for investigating the dynamics of decisionmaking processes requiring coordination. GRA

N88-26262# National Academy of Sciences - National Research Council, Washington, DC. Cross-Disciplinary Engineering Research Committee.

ENGINEERING RESEARCH CENTERS AND THEIR EVALUATION Final Report

Jan. 1988 17 p
(Contract NSF ENG-85-05051)
(PB88-180054) Avail: NTIS HC A03/MF A01 CSCL 05A

Recommendations regarding the National Science Foundation's (NSF) plans for evaluating existing Engineering Research Centers (ERCs) are followed up. The first six centers are evaluated. One observation is that the most prevalent types of problems found in the centers were managerial and organizational. The NSF is urged to make the third-year evaluations as constructive as possible and to avoid overmanagement of the ERCs. It is recommended that a third, probationary, option be added to the yes-no refunding decision plan, deferring the final decision for one year. Various other recommendations are made regarding the preparations for and the mechanics of the actual reviews and site visits. Certain important issues in the context of cross-disciplinary research (e.g. promotion and reward, distribution of funds) are pointed out and discussed from the standpoint of the ERC evaluation. GRA

N88-26264*# Management Learning Systems, Silver Spring, MD.

ANATOMY OF AN ORGANIZATIONAL CHANGE EFFORT AT THE LEWIS RESEARCH CENTER Final Report

JAMES R. HAWKER and RICHARD S. DALI Washington
NASA Apr. 1988 34 p
(Contract C21660-K)
(NASA-CR-4146; E-4127; NAS 1.26:4146) Avail: NTIS HC A03/MF A01 CSCL 05A

By 1979, after a long decline following the end of the Apollo program, the Lewis Research Center found its very existence endangered because it was not doing the kind of research that could attract funding at the time. New management under Andrew J. Stofan applied a program of strategic planning, participative management, and consensus decision making. A corporate-cultural change was effected which enabled Lewis to commit itself to four fundable research and development projects. Morale-building and training programs which were essential to this change are described. J.P.B.

N88-26802# Bolt, Beranek, and Newman, Inc., Cambridge, MA.
PLANS FOR DISCOURSE
BARBARA J. GROSZ and CANDACE L. SIDNER 1 Feb. 1988
35 p

02 MANAGEMENT THEORY AND TECHNIQUES

(Contract N00014-85-C-0079)
(AD-A192242; BBN-6728) Avail: NTIS HC A03/MF A01 CSDL
05H

Discourses are fundamentally instances of collaboration behavior. We propose a model of the collaborative plans of agents achieving joint goals and illustrate the role of these plans in discourses. Three types of collaborative plans, called Shared Plans, are formulated for joint goals requiring simultaneous, conjoined or sequential actions on the part of the agents who participate in the plans and the discourse; a fourth type of Shared Plan is presented for the circumstance where two agents communicate, but only one acts. GRA

N88-27108* # National Academy of Sciences - National Research Council, Washington, DC. Space Science Board.
ISSUES AND RECOMMENDATIONS ASSOCIATED WITH DISTRIBUTED COMPUTATION AND DATA MANAGEMENT SYSTEMS FOR THE SPACE SCIENCES
1986 124 p
(Contract NASW-3482)
(NASA-CR-183026; NAS 1.26:183026; PB88-188446) Avail:
NTIS HC A06/MF A01 CSDL 05B

The primary purpose of the report is to explore management approaches and technology developments for computation and data management systems designed to meet future needs in the space sciences. The report builds on work presented in previous reports on solar-terrestrial and planetary reports, broadening the outlook to all of the space sciences, and considering policy issues aspects related to coordination between data centers, missions, and ongoing research activities, because it is perceived that the rapid growth of data and the wide geographic distribution of relevant facilities will present especially troublesome problems for data archiving, distribution, and analysis. GRA

N88-27726* # National Inst. of Health, Bethesda, MD. National Eye Inst.
VISION RESEARCH. A NATIONAL PLAN: 1983-1987, 1987 EVALUATION AND UPDATE Final Report, Oct. 1984 - Dec. 1986
1987 334 p
(PB88-192604; NIH/PUB-87-2755) Avail: NTIS HC A15/MF A01
CSDL 06P

The evaluation project examined the current level and distribution of effort in all the scientific research areas addressed by Vision Research-A National Plan: 1983-1987, the National Advisory Eye Council's most recent planning and evaluation document. It recognized and encouraged activity in important new areas that had developed since the Plan was prepared. It identified recommendations that were not sufficiently specific or those that were premature or too narrow in focus and might have benefited from consolidation with other recommendations. A computerized system was developed and used to track grant applications wherein every grant application, whether funded or not, was coded according to the relevance to one of the Plan's recommendations. The report produced by this effort was used by the National Advisory Eye Council and the staff of the NEI to determine long-range and day-to-day management decisions, by scientists in the vision research community as a guide to most important needs and opportunity as a guide to the most important needs and opportunities in the field; and by organizations, foundations, all those interested in recent problems and challenges in ophthalmology, optometry, and vision science, including current activities and plans for continued success in the prevention, treatment, and control of blinding disease. GRA

N88-29468* # Princeton Univ., NJ. Dept. of Computer Science.
FINDING MINIMUM-COST CIRCULATIONS BY CANCELING NEGATIVE CYCLES
ANDREW V. GOLDBERG and ROBERT E. TARJAN Jul. 1987
20 p
(Contract N00014-80-C-0622; N00014-87-K-0467)
(AD-A194027; CS-TR-107-87) Avail: NTIS HC A03/MF A01
CSDL 12D

A classical algorithm for finding a minimum-cost circulation consists of repeatedly finding a residual cycle of negative cost and canceling it by pushing enough flow around the cycle to saturate an arc. We show that a judicious choice of cycles for canceling leads to a polynomial bound on the number of iterations in this algorithm. This gives a very simple strongly polynomial algorithm that uses no scaling. A variant of the algorithm that uses dynamic trees runs in $O(nm(\log n) \min \log(nC), m \log n)$ time on a network of n vertices, m arcs, and arc costs of maximum absolute value C . This bound is comparable to those of the fastest previously known algorithms. GRA

N88-29469* # Princeton Univ., NJ. Dept. of Computer Science.
FINDING MINIMUM-COST CIRCULATIONS BY SUCCESSIVE APPROXIMATION
ANDREW V. GOLDBERG and ROBERT E. TARJAN Jul. 1987
56 p
(Contract N00014-80-C-0622; N00019-87-K-0467)
(AD-A194028; CS-TR-106-87) Avail: NTIS HC A04/MF A01
CSDL 12D

A new approach to solving minimum-cost circulation problems is developed. This approach combines methods for solving the maximum flow problem with successive approximation techniques based on cost scaling. The authors measure the accuracy of a solution by the amount that the complementary slackness conditions are violated. They propose a simple minimum-cost circulation algorithm, one version of which runs in $O(cu n \log(nC))$ time on an n -vertex network with integer arc costs of absolute value at most C . By incorporating sophisticated data structures into the algorithm, we obtain a time bound of $O(nm \log(sq n/m) \log(nC))$ on a network with m arcs. A slightly different use of our approach shows that a minimum-cost circulation can be computed by solving a sequence of $O(n \log(nC))$ blocking flow problems. A corollary of this result is an $O(sq n (\log n) \log(nC))$ -time, n -processor parallel minimum cost circulation algorithm. This approach also yields strongly polynomial minimum-cost circulation algorithms. Results provide evidence that the minimum-cost circulation problem is not much harder than the maximum flow problem. It is believed that a suitable implementation of this method will perform extremely well in practice. GRA

N88-30370* # SRI International Corp., Menlo Park, CA. Artificial Intelligence Center.
RESEARCH ON PROBLEM-SOLVING SYSTEMS Final Report, 1 Oct. 1984 - 14 Feb. 1988
DAVID E. WILKINS Feb. 1988 164 p
(Contract F49620-85-K-0001)
(AD-A195154; AFOSR-88-0563TR) Avail: NTIS HC A08/MF A01
CSDL 12I

This is the final report for a research project which focused on artificial intelligence planning systems. The research investigated methods for representing, generating, and executing hierarchical plans that contain parallel actions. Reasoning about actions is critical to many important areas including automatic planning systems, expert consultation systems, and real-time control of robotic systems. This report describes progress in planning, including efficient techniques for generating hierarchical and parallel plans in certain domains. This work was performed using SIPE (System for Interactive Planning and Execution Monitoring) which was developed in part under this contract. GRA

N88-30466* # Glasgow Univ. (Scotland). Business School.
TECHNICAL CHANGE NEEDS ORGANIZATIONAL CHANGE
DAVID BODDY *in* AGARD, Barriers to Information Transfer and Approaches Toward Their Reduction 5 p Mar. 1988
Avail: NTIS HC A06/MF A01

It is shown that effective performance cannot be assured simply by installing expensive, state of the art technology. The studies of many applications of computing and information technology have included both successful and unsuccessful examples. The clear practical lesson from this work is that the successful cases were usually those where technical change was accompanied by appropriate organizational change. The less successful ones were

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generally those where project were dominated by technical considerations, with little of no thought given to organizational ones. These lessons seem as relevant to defence installations as to the civilian ones in which the research was conducted. The common characteristic is that all organizations are confronted by technical developments, which are intended to help them meet their objectives. For them to succeed in that task, it appears that management needs to ensure that three big hurdles are successfully crossed. These are: managing the project, setting the right objectives; and changing the organization. Each of these hurdles will be outlined in turn, and some proposals on how they can be overcome are suggested.

Author

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INDUSTRIAL MANAGEMENT AND MANUFACTURING

Includes Industrial Management, Engineering Management, Design Engineering, Production Management, Construction, Aerospace/Aircraft Industries, Manufacturing.

A88-14267#

PROJECT MANAGEMENT ISSUES AND LESSONS LEARNED FROM COMPUTER AIDED DESIGN APPLICATIONS

J. J. DAUES (McDonnell Douglas Corp., Saint Louis, MO) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Saint Louis, MO, Sept. 14-16, 1987. 6 p.
(AIAA PAPER 87-2912)

An account is given of the development status and prospective capabilities of proprietary computer graphics programs for future automated factories, with attention to social/organizational, technology assessment, and human resource issues. Critical factors in the performance of these graphics programs are identified as the maximization of personnel colocation, the definition of manufacturing approaches, and the exclusive use of three-dimensional coordination, with emphasis on the maximization of three-dimensional outputs. Computer graphics projection rooms for design reviews should be provided.

O.C.

A88-15307

INDUSTRIAL MODERNIZATION INCENTIVES PROGRAM - USES IN SPACE SYSTEM PRODUCING INDUSTRY

MARK W. PHILLIPS (USAF, Systems Command, Wright-Patterson AFB, OH) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 8 p.

The findings of past and present Air Force Production Base Analyses acknowledge the existence of numerous production bottlenecks and constraints within the defense industrial base. These impediments to the successful fielding of weapon systems are often caused by inefficient manufacturing techniques and obsolescent plant equipment. In an effort to correct these deficiencies, the Air Force has embarked upon a unique program to induce contractors to invest in factory modernization projects utilizing the latest in production technology. The program is known in the Department of Defense as the Industrial Modernization Incentives Program (IMIP). This paper discusses IMIP and how Air Force Systems Command and Space Division uses this contractual vehicle to provide incentives to contractors to implement modern equipment and management techniques in space system producing industry. Examples are given of improvements in space system production by the use of IMIP.

Author

A88-15312

AIR FORCE SPACE REQUIREMENTS - CAN INDUSTRY MEET THE CHALLENGE FOR SPACE SYSTEMS?

EDWARD S. HOUSTON (USAF, Los Angeles Air Force Station, CA) and MARK W. PHILLIPS (USAF, Systems Command,

Wright-Patterson AFB, OH) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 16 p.

The findings, conclusions, and recommendations resulting from an analysis of the space industrial base are presented. The analysis (titled the United States Air Force Production Base Analysis) is an ongoing assessment of the health and surge/mobilization capabilities of the defense industrial base. Emphasis is placed on the capability and capacity of the space industries to produce space systems the Air Force needs through 1990. Space power technology issues discussed include precision instruments bearings production base, beryllium availability, optical lenses and assemblies, a material control system, and MANTECH/IMIP at subtier level. The general conclusion is that the health of the space industrial base is good, but the demand being placed on space industries is growing quickly.

B.J.

A88-16241#

THIRTY YEARS OF SPACE WITH MCDONNELL AND DOUGLAS

CHARLES D. WALKER (McDonnell Douglas Astronautics Co., Saint Louis, MO) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 5 p. refs
(IAF PAPER 87-665)

The contributions of the McDonnell Aircraft Company and the Douglas Aircraft Company (prior to and following their consolidation) to the NASA space program are discussed. Aspects of the design of the Mercury capsules and the Gemini spacecraft are considered. Upgraded versions of the Thor IRBM launch system were used for the Ariel 1, and are currently in use as the Delta. Also discussed are the Saturn S-IV/IVB stage program and the Payload Assist Module. Current activities include Space Shuttle launch support, space commercialization efforts, mission planning support, and the Space Station.

R.R.

A88-16912

AVIONICS IN CONCEPTUAL SYSTEM PLANNING; PROCEEDINGS OF THE EIGHTH ANNUAL IEEE SYMPOSIUM, DAYTON, OH, DEC. 3, 1986

Symposium sponsored by IEEE. New York, Institute of Electrical and Electronics Engineers, Inc., 1986, 92 p. For individual items see A88-16913 to A88-16920.

The papers presented in this volume deal with various aspects of the problem of integrating avionics into total system design during the concept formulation stage, with particular attention given to impacts upon definition of requirements; future avionics concepts; tradeoffs between the vehicle, propulsion, and avionics; integration of supportability into the design; and acquisition strategies. Papers are included on system architecture design and tools for a distributed avionics system; the design agent process as a strategy for future avionics competition enhancement and quality assurance; the avionics acquisition process beyond the year 2000; and electromagnetic compatibility modeling for future avionics systems.

V.L.

A88-17945

PRACTICAL SOLUTIONS TO PROBLEMS IN EXPERIMENTAL MECHANICS, 1940-85: A HISTORY

GIVEN ANKENY BREWER (Brewer Engineering Laboratories, Inc., Marion, MA) New York, Vantage Press, 1987, 250 p. refs

Advances in stress/strain measurement technology are recalled in a collection of the author's previously published papers. Topics discussed include photogrid determination of strain distribution, measurement of strain in the plastic range, the use of stainless steel in jet-aircraft structures, operating stresses in ship propellers, and dynamic-pressure measurement in a liquid-Na pipe using an electromechanical dilatometer. Consideration is given to bonded resistance strain gages for use on offshore oil platforms, power-plant vibration absorber systems, and residual-stress measurement in rapid-transit axles. Each paper is provided with a brief historical/autobiographical introduction.

T.K.

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A88-18499#

BLIMPS ARE BACK ON BOARD

RICHARD DEMEIS Aerospace America (ISSN 0740-722X), vol. 25, Nov. 1987, p. 34-37.

An evaluation is made of the novel technologies and design features that are to be incorporated in the USN's next-generation radar surveillance airships, typified by the Sentinel 5000 whose initial flight trials are scheduled for 1990. Sentinel will cruise at 40 kt for 2.5 days at 5000 ft altitude, and could be replenished from ships for longer patrols. The radar antenna will be mounted atop the gondola, inside the gas envelope. Pressurization of the crew compartment will allow the airship to reach a maximum altitude of 14,000 ft. At 10,000 ft, the radar horizon is 125 n.mi. Attention is given to envelope construction considerations. O.C.

A88-21000#

AEROSPACE HIGHLIGHTS 1987

Aerospace America (ISSN 0740-722X), vol. 25, Dec. 1987, p. 12-16, 18-24, 26-35 (26 ff.).

The present comprehensive evaluation of developments in the aerospace sciences and industries during 1987 encompasses aeroacoustics, aerodynamic decelerator and balloon technology, maintenance, electrical power sources, air-breathing propulsion, air transportation, aircraft design, applied aerodynamics, astrodynamics, the atmospheric environment, flight mechanics, C3I, communications, computer systems, design engineering, digital avionics, electric propulsion, flight simulation, flight testing, fluid dynamics, general aviation, and ground testing. Also discussed are interactive computer graphics, life support systems, LTA vehicles, liquid-fuel rockets, advanced materials, missiles, lasers, propellants, sensors, software, solid-fuel rockets, space systems and operations, space transportation, structural dynamics, advanced structures, support systems, thermophysics, and system effectiveness and safety. O.C.

A88-21664

LASERS IN MOTION FOR INDUSTRIAL APPLICATIONS; PROCEEDINGS OF THE MEETING, LOS ANGELES, CA, JAN. 13, 14, 1987

DAVID A. BELFORTE, ED. Meeting sponsored by SPIE and Society of Manufacturing Engineers. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 744), 1987, 196 p. No individual items are abstracted in this volume. (SPIE-744)

Papers are presented on multidimensional laser processing systems; high-production laser industrial motion systems; CO₂ lasers in sheet metal cutting systems; robots and lasers; laser precision processing machine for industrial applications; precision cutting and drilling with the Nd-YAG laser; and surface-roughness monitoring for industrial quality control. Topics discussed included laser soldering of surface-mounted devices; laser welding of thin filaments; laser wire stripping; and precision Co₂ laser cutting of small parts. Consideration is given to the development of a transmission gear laser weld system; laser selection for drilling; three-dimensional laser processing; the application of laser cladding of multidimensional part geometries; microscopic material interactions by laser engraving; laser marked codes for paperless tracking applications; and state of the art in laser marking and engraving. I.F.

A88-24807

ENGINEERING MANAGEMENT: CONCEPTS, PROCEDURES AND MODELS

B. S. DHILLON (Ottawa, University, Canada) Lancaster, PA, Technomic Publishing Co., Inc., 1987, 373 p. refs

Engineering management (EM) techniques are examined in an introductory text intended for undergraduate and graduate engineering and EM students. Chapters are devoted to organizing, the human element in EM, creativity, manpower planning and control, selecting engineering projects, project management, EM of technical proposals and specifications, EM of contracts, and techniques for making better EM decisions. Consideration is given

to mathematical models of EM decision making, product development and costing, EM of design and drawings, value engineering and configuration management, EM of product assurance sciences, EM of maintenance, marketing, product warranties and liabilities, and work study. Diagrams, tables, and exercises are provided. T.K.

A88-24823

FUTURE AEROSPACE-MATERIALS DIRECTIONS

ROBERT A. SPRAGUE (GE Materials Technology Laboratory, Evendale, OH) Advanced Materials and Processes (ISSN 0882-7958), vol. 133, Jan. 1988, p. 67-69.

Barriers to higher performance posed by airframe and propulsion system structural alloys' melting points and phase transition temperatures must be overcome in order to realize the requirements of such next-generation aircraft as the National Aerospace Plane and Advanced Tactical Fighter. The R&D efforts currently underway to meet these requirements are dominated by low-ductility and anisotropic (composite) materials such as intermetallics, ceramic-matrix composites, metal-matrix composites, and high temperature polymeric-matrix composites; affordability is the key to the success of these materials. Metal-matrix composites are noted to offer enormous advantages in high-temperature performance, with excellent strength/weight ratios. O.C.

A88-26420

SPACE STATION ASSEMBLY - TECHNIQUES AND STRUCTURES

E. J. PELKA (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) Lockheed Horizons (ISSN 0459-6773), Dec. 1987, p. 32-49.

Two Lockheed independent research and development projects are discussed. The first, Space Station Assembly Technology, addresses on-orbit structural assembly from the viewpoint of the EVA astronaut and emphasizes human factors engineering, operations, and EVA optimization. The second, Aluminum-Clad Graphite/Epoxy Struts, stresses areas of materials, structures, and manufacturing in the production of full-scale prototype truss elements that can be fine-tuned to a zero coefficient of thermal expansion after the metal/composite strut has been produced. It is shown that as the Space Station physical characteristics will continue to change, the Station's subsystems, ground support systems, and operations methods must similarly evolve to accommodate technological advances. A.S.

A88-26646#

KEEPING A SHARP TECHNOLOGY EDGE

JAY C. LOWNDES Aerospace America (ISSN 0740-722X), vol. 26, Feb. 1988, p. 24-28.

The erosion of the U.S. share of the world aircraft market may be taken as evidence of a narrowing of technical preeminence. Attention is presently given to NASA, Federal Government and industry efforts to validate advanced technologies for expeditious commercial application. These technologies encompass advanced structural materials, advanced propulsion system thermodynamic cycles and configurations, and efforts to reduce boundary layer drag in both subsonic airliners and post-Concorde SSTs. Attention is given to the economic support required for suitable R&D. O.C.

A88-31339

FUTURE AEROSPACE PROJECTS OR ENGINEERING THE FUTURE FOR UK LTD

IVAN YATES (British Aerospace, PLC, London, England) Aerospace (UK) (ISSN 0305-0831), vol. 16, April 1988, p. 10-17.

The importance of British aerospace to the British economy and the prospects for its future development are addressed. The case for an expanded British space effort is summarized. The role of British industry in the world market is discussed, and the importance of technological innovation in maintaining and developing that role is examined. C.D.

A88-34101

CATS: COMPUTER-AIDED TRADE STUDY METHODOLOGY

HERMANN SCHMID, STANLEY LARIMER, and TAHM SADEGHI

(General Electric Co., Binghamton, NY) IN: NAECON 87; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1987. Volume 2. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 560-568. refs

A computerized methodology and its implementation that greatly simplifies and speeds up the processes of performing trade studies are described. The main difference between the computer-aided trade study (CATS) methodology and the conventional approach is that most of the labor-intensive tasks have been eliminated. Improved productivity, accuracy and cost result from using CATS on trade studies. I.E.

A88-35526

RECENT TRENDS IN AEROELASTICITY, STRUCTURES, AND STRUCTURAL DYNAMICS; PROCEEDINGS OF THE R. L. BISPLINGHOFF MEMORIAL SYMPOSIUM, UNIVERSITY OF FLORIDA, GAINESVILLE, FL, FEB. 6, 7, 1986

PRABHAT HAJELA, ED. (Florida, University, Gainesville) Symposium sponsored by NSF, USAF, and MIT; Gainesville, FL, University Presses of Florida, 1987, 424 p. For individual items see A88-35527 to A88-35547. (Contract NSF ECE-86-02170)

The papers contained in this volume provide an overview of the state of the art in the field of aeroelasticity and aeronautical structures, including surveys of well-developed fields of study and new contributions in emerging areas of technology. The subject areas covered include fixed and rotary wing aeroelasticity; aeroelastic considerations in rotating machinery; aeroelastic problems in bridge design; structural analysis and structural dynamics in aerospace applications; aeroservoelastic considerations; and the emerging discipline of optimal structural design. Papers are presented on the whirl flutter of swept tip propfans; aeroelasticity of very light aircraft; structural stability in turbulent flow; and structural tailoring of aircraft performance. V.L.

A88-39660

PERSPECTIVES ON PROJECT MANAGEMENT

R. N. G. BURBRIDGE, ED. (Central Electricity Generating Board, London, England) London, Peter Peregrinus, Ltd. (IEE Management of Technology Series. Volume 7), 1988, 167 p. No individual items are abstracted in this volume.

The fundamental principles of engineering project management (PM) are examined, with an emphasis on UK practice, in chapters contributed by leading experts. Topics addressed include historical and contemporary perspectives, a client's view of PM, the project and the community, high-budget projects, joint-venture projects, and contract strategy. Consideration is given to turnkey vs multicontract projects, quality assurance and PM, computer applications to PM, and the essential features of PM. T.K.

A88-41288* National Aeronautics and Space Administration, Washington, DC.

NATIONAL AERO-SPACE PLANE

WILLIAM M. PILAND (NASA, Arlington, VA) IN: Visions of tomorrow: A focus on national space transportation issues; Proceedings of the Twenty-fifth Goddard Memorial Symposium, Greenbelt, MD, Mar. 18-20, 1987. San Diego, CA, Univelt, Inc., 1987, p. 219-222. (AAS PAPER 87-127)

An account is given of the technology development management objectives thus far planned for the DOD/NASA National Aero-Space Plane (NASP). The technology required by NASP will first be developed in ground-based facilities and then integrated during the design and construction of the X-30 experimental aircraft. Five airframe and three powerplant manufacturers are currently engaged in an 18-month effort encompassing design studies and tradeoff analyses. The first flight of the X-30 is scheduled for early 1993. O.C.

A88-42307

SCHEDULE MONITORING OF ENGINEERING PROJECTS

M. J. SCHMIDT (Digital Equipment Corp., Marlborough, MA) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, May 1988, p. 108-114. refs

A tool for monitoring, reporting, and controlling the progress of time-critical projects called progress plotting is presented. It helps distinguish between minor schedule slips and problems that call for serious management intervention. It also serves to evaluate planning accuracy on previous projects. Progress is shown by plotting the actual time used on a project against the completed percentage of the critical path. Control lines in the plotting space indicate probabilities of completing the project on schedule. If the progress line crosses a low-probability control line, managers may want to intervene and bring the project back on schedule. Crossing a high-probability control line means an early finish may be anticipated with confidence. The progress plot is comparable to the process-control chart used in manufacturing settings. I.E.

A88-42377

DATA MANAGEMENT FOR THE FACTORY FLOOR

THOMAS H. BLUHM (Boeing Aerospace Co., Seattle, WA) IN: Materials - Pathway to the future; Proceedings of the Thirty-third International SAMPE Symposium and Exhibition, Anaheim, CA, Mar. 7-10, 1988. Covina, CA, Society for the Advancement of Material and Process Engineering, 1988, p. 796-804.

An early task, when setting out to automate a factory, is to identify the required information for controlling machinery operations and worker activities. This paper presents examples of data management issues in a computer integrated manufacturing environment. Data management issues to be addressed are data organization, data integrity, and data handling across system interfaces. Design solutions that could be adapted for any automation project are presented. Author

A88-43951

SPACE MANUFACTURING 6 - NONTERRESTRIAL RESOURCES, BIOSCIENCES, AND SPACE ENGINEERING; PROCEEDINGS OF THE EIGHTH PRINCETON/AIAA/SSI CONFERENCE, PRINCETON, NJ, MAY 6-9, 1987

BARBARA FAUGHNAN, ED. and GREGG E. MARYNIAK, ED. Conference sponsored by AIAA and Space Studies Institute. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, 412 p. For individual items see A88-43952 to A88-43972, A88-43974 to A88-43993.

The present conference on the colonization and economic exploitation of space considers topics in biomedics, space transportation, nonterrestrial resources, the use of launch vehicle external tanks as structural bases for space habitats, international law and economics considerations, the technological bases of space manufacturing plant and solar power satellites, artificial biospheres and closed-cycle life-support systems, and the social aspects of spaceflight. Attention is given to bone and muscle response to long-duration space missions, the energetics of closed biological life-support systems, a LEO space farm, crew factors in NASA Space Station design, the economic impact of extraterrestrial medicine, beamed energy for spacecraft propulsion, the electric rail rocket, and the extraction of silicon, aluminum, and oxygen from lunar ore. O.C.

A88-43966#

A JOB FOR SPACE MANUFACTURING

J. W. STRYKER IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 158-163.

Space habitation will create a need for a general purpose repair, rebuilding, and manufacturing facility. The self-contained 'job shop' concept fits this need. A single, multi-purpose machine tool combined with a large variety of accessories is proposed. This uses existing and proven technology, requiring only some minor adaptation for work in space. Also, there is a large experience base of job shop techniques which can be drawn upon. A job shop can modify tools and equipment already in orbit. It can perform

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production manufacturing for many of the sub-components needed in the construction of additional habitats. This adaptability also provides valuable capacity when Shuttle or other transportation links may experience delays. It creates a 'bootstrapping' capability which can significantly lower manufacturing costs in space. This paper presents specific design aspects which can help achieve this goal. Author

A88-44001
**ADVANCED TOPICS IN MANUFACTURING TECHNOLOGY:
PRODUCT DESIGN, BIOENGINEERING; PROCEEDINGS OF
THE SYMPOSIUM, ASME WINTER ANNUAL MEETING,
BOSTON, MA, DEC. 13-18, 1987**

PHILIP H. FRANCIS, ED. Symposium sponsored by ASME. New York, American Society of Mechanical Engineers, 1987, 106 p. For individual items see A88-44002 to A88-44007.

Papers on manufacturing technology related to engineering are presented in the fields of product design, bioengineering, and space commercialization. Aspects of product design and bioengineering covered included design issues in mechanical tolerance analysis, computer-aided product design for economical manufacture, gestural control of industrial robots applied to surgical instrument positioning, voice control of manufacturing systems, eye tracking control of robotic systems, and man-machine interaction. Topics in space commercialization include an overview of space commercialization by an aerospace corporation, commercial development of space, power system technology, welding in space, remote sensing technology and applications, commercial materials processing in the space station, and microgravity science and applications projects and payloads. R.B.

A88-44875#
**ALL ELECTRONIC PROPULSION - KEY TO FUTURE
SPACESHIP DESIGN**

WILLIAM C. BROWN (Microwave Power Transmission Systems, Weston, MA) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 24th, Boston, MA, July 11-13, 1988. 20 p. refs (AIAA PAPER 88-3170)

The all-electronic propulsion system combines the high specific impulse of the ion thruster with beamed microwave power to produce a combined power and propulsion system with a self-acceleration as greater at 0.02 m/sec sq with a specific impulse of 4200. This is more than an order of magnitude greater than that provided by other approaches to electric propulsion in their current state of development, including nuclear and photovoltaic power sources. Associated with this new technology are two requirements for its execution: (1) the space vehicles and earth based transmitters must be based in the equatorial plane; and (2) the vehicles are large in area and have very high thrust levels because of efficiency and cost considerations associated with the microwave beam system. These vehicles, both in size and physical configuration, are different from conventional space vehicles and may have an impact upon future space vehicle design including those using photovoltaic power. Author

A88-45596
**AIRCRAFT ELECTRICAL SYSTEMS (3RD REVISED AND
ENLARGED EDITION)**

E. H. J. PALLETT Harlow, England/New York, Longman Scientific and Technical/John Wiley and Sons, Inc., 1987, 239 p.

An introduction to aircraft electrical systems is presented in a textbook for maintenance engineers and pilots. Fundamental electrical principles on generation and conversion of power supplies are reviewed and applied to aircraft systems. Topics covered include ac and dc power supplies, power conversion equipment, external and auxiliary power supplies, and power distribution. Circuit controlling and protection devices, measuring instruments, and warning indication systems are examined. Power utilization by motors and systems, and electrical diagrams and identification schemes are discussed. R.B.

A88-46296
**INTRODUCTION TO FINE CERAMICS: APPLICATIONS IN
ENGINEERING**

NOBORU ICHINOSE (Waseda University, Tokyo, Japan), KOMEYA KATSUTOSHI, NAOHIKO OGINO, AKIHIKO TSUGE, and YUUJI YOKOMIZO Chichester and New York, John Wiley and Sons, Ltd., 1987, 169 p. Translation.

Recent advances in ceramics technology and applications are discussed in a question-and-answer format and illustrated with extensive diagrams, drawings, graphs, photographs, and tables of numerical data. Chapters are devoted to the fundamental properties of ceramics, structural ceramics, electronic ceramics (piezoelectric materials, sensors, and ferrites), and glasses and optical fibers. Also considered are biological applications, amorphous ceramics, high-thermal-conductivity ceramics, and laminated and multilayer ceramics. T.K.

A88-46310
MATERIALS AND THE DESIGNER

ERIC H. CORNISH Cambridge and New York, Cambridge University Press, 1987, 290 p. refs

The principles and criteria used by design engineers to select materials for manufacturing applications are examined, and the properties of the major classes of materials are described. The impact of design on the manufacturing industry and the expertise required by the design process are discussed, and individual chapters are devoted to metals and alloys, ceramics, polymers, composites, in-service performance, finishes and protective coatings, reliability and service life, factors controlling the selection of substitute materials, forming processes, sources of detailed material information, and standards. Diagrams, graphs, and extensive tables of numerical data are provided. T.K.

A88-46401
LARGE SPACE STRUCTURES: DYNAMICS AND CONTROL
SATYA N. ATLURI, ED. (Georgia Institute of Technology, Atlanta) and ANTHONY K. AMOS, ED. (USAF, Office of Scientific Research, Bolling AFB, Washington, DC) Berlin and New York, Springer-Verlag, 1988, 373 p. For individual items see A88-46402 to A88-46414.

Recent advances in the dynamical design and control theory of large space structures (LSSs) are examined in chapters contributed by leading experts. Topics addressed include continuum modeling of large lattice structures, computational aspects of nonlinearities in the dynamics and control of LSSs, modal cost analysis for simple continua, the transient dynamics of flexible LSSs, control-LSS interaction analysis, the dynamical response of an LSS to pulse excitation, and modeling techniques for open- and closed-loop LSS dynamics. Consideration is given to dynamic friction, control of distributed structures, the acoustic limit of structural-dynamic control, active control for vibration damping, a unified theory of reduced-order robust control design, adaptive control of LSSs, and unified optimization of structures and controllers. T.K.

A88-48454
**ELECTRICALLY CONDUCTING PLASTICS - NEW MATERIALS
FROM AEROSPACE RESEARCH**

TEH S. KUAN and RANDY CAMERON (Lockheed Aeronautical Systems Co., Burbank, CA) Lockheed Horizons (ISSN 0459-6773), May 1988, p. 48-56.

An account is given of the development status and range of currently available compositions and performance properties of electrically conducting plastics. The first of these, the serendipitously discovered polyacetylene, was useful as a battery electrode in rechargeable cells but was found to be dangerously unstable in air. Attention is given to novel proprietary conducting plastic compositions that are stable in air or water at all conductivity levels (of which the highest are fully comparable to those of metals) and which are stable in mutual contact; this latter property allows the production of circuit boards. The new plastics are noted to be produced in conducting or semiconducting form for less than \$1.00/lb (by contrast to semiconducting silicon, which costs about

\$100,000.00/lb), and can be blended with structural plastics to form high-strength conductive materials applicable to aircraft construction. O.C.

A88-49969

ADVANCED COMPOSITE MATERIALS PRODUCTS AND MANUFACTURERS

D. J. DE RENZO, ED. Park Ridge, NJ, Noyes Data Corp., 1988, 1119 p. No individual items are abstracted in this volume.

Polymer matrix composites are considered with attention given to high-temperature materials, flame-retardant materials, conductive materials, electrostatic dissipating materials, lubricated/wear-resistant materials, foaming grade materials, and elastomeric materials. Information is also provided on graphite, polyimide, epoxy-glass, phenolic, and polyester prepregs. Other topics include GFRPs, ceramic-matrix composites, metal-matrix composites, and CFRPs. K.K.

A88-51738

SATELLITES INTERNATIONAL

JOSEPH N. PELTON, ED. (INTELSAT, Washington, DC) and JOHN HOWKINS, ED. New York, Stockton Press, 1987, 269 p. For individual items see A88-51739 to A88-51745.

Various topics concerning satellite systems and issues surrounding satellite communications are examined. Aspects discussed include an introduction to satellites and satellite technology, world telecommunications leaders, earth station antennas, the economics of satellite communication, public policy issues and remote sensing, video and audio conferencing networks, satellites and the press, future satellite systems, satellite manufacturers, main launch vehicles, global and regional satellite systems, and applications satellites. Specific systems considered include Intelsat, Inmarsat, and Intersputnik. Directories of international satellite communications organizations and of nations, their governmental departments which handle satellite issues, satellites they have launched, and earth station facilities which they have constructed. R.B.

A88-51745

SATELLITE MANUFACTURERS AND SYSTEMS

IN: Satellites international. New York, Stockton Press, 1987, p. 111-117.

A list of major manufacturers of satellites and satellite components is presented. The spacecraft and systems produced by these manufacturers are briefly discussed. Tables are given, showing how many satellites have been constructed, launch data, frequency bands, functions, and number of channels. Also, the main components of communication satellite platforms and payloads are reviewed. R.B.

A88-51813

POLYMER COMPOSITES FOR AUTOMOTIVE APPLICATIONS; PROCEEDINGS OF THE INTERNATIONAL CONGRESS AND EXPOSITION, DETROIT, MI, FEB. 29-MAR. 4, 1988

Congress and Exposition sponsored by SAE, Warrendale, PA, Society of Automotive Engineers, Inc. (SAE Proceedings SP-748), 1988, 131 p. For individual items see A88-51814 to A88-51818.

The properties, preparation and processing, and automotive and aerospace applications of advanced polymer-matrix composites are discussed in reviews and reports. Topics addressed include high-performance composites research at NASA Langley, the thermooxidative stability of commercial graphite fibers for CFRPs, a semicrystalline polyimidesulfone powder, the dynamic mechanical properties of high-temperature PMR polyimides and composites, and transportation applications of reinforced techniques for automotive plastics and composites, compression-molded metal-thermoplastic composite laminates, phenolic engine components, economic modeling of composite phenolic engine components, economic modeling of composite manufacturing, and process considerations for reaction injection molding of composites. T.K.

A88-51957#

MANAGING ENGINEERING DESIGN INFORMATION

R. E. FULTON (Georgia Institute of Technology, Atlanta) and CHAO-PIN YEH AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 12 p. Research supported by the Institute for Defense Analyses and USAF. refs (AIAA PAPER 88-4452)

An account is given of state-of-the-art aerospace vehicle design practices that are highly integrated and automated, with a view to the features of their associated data base management system models and their existing deficiencies. Attention is given to the nature and comparative value of process/data-modeling methodologies proposed, and to the illustrative test problem of an aircraft wing's composite panel design; this problem is used to evaluate seven different process/data-modeling methodologies: three versions of the USAF's IDEF methodologies, the Systematic Activity Modeling Method, Nijssen's (1987) Information Analysis Method, the Entity-Relationship Model, and the Object-Oriented Data Model. O.C.

A88-51968#

THE ROLE OF REGULATIONS IN AIRCRAFT DESIGN EDUCATION

JAN ROSKAM (Kansas, University, Lawrence) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 12 p. refs (AIAA PAPER 88-4485)

Attention is given to several important examples of the effects of airworthiness regulations on aircraft design decision-making, as they emerge in the course of educational efforts. Typical of the requirements discussed are maximum allowable noise levels, mission fuel reserves at end of design mission, frequency and damping requirements in flying qualities, minimum control speed with one or more engines inoperative, fuel system safety, and the probability of foreign object damage to engines. It is recommended that airworthiness regulations be taught to aeronautical engineering students. O.C.

A88-53788

USE OF A DETAIL COST MODEL TO PERFORM CONCEPTUAL PHASE COST ANALYSIS

PAUL SCHWARTZ (Grumman Corp., Aircraft Systems Div., Bethpage, NY) SAWE, Annual Conference, 46th, Seattle, WA, May 18-20, 1987. 13 p. (SAWE PAPER 1784)

A detail cost model which can be used in cost analysis and at higher levels of the work breakdown structure is examined. The model was developed to perform cost versus system parameter evaluations early in the design cycle. The use of up-front parametric models, the costing concept of this model, and calibrating the model against development costs are discussed. The model is compared with other development cost models with good results. The model does not include elements such as flight test in its development costs. R.B.

A88-55331#

RISK MANAGEMENT FOR THE SPACE STATION PROGRAM

BAL KRISHAN (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 7 p. (IAF PAPER 88-061)

A risk management approach for the Space Station is presented, based on the principle that system acquisition is founded on the interrelation between design, testing, and production. A definition of risk is presented, and risk sources and control are discussed. The architecture of the risk management system is given. The three steps of the system's methodology are risk identification and assessment, risk prioritization, and risk resolution and statusing. A quantitative risk assessment model has been developed, identifying the most sensitive risk items. A production schedule and control system is being established to provide early warning

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and control of potential problems to ensure smooth transition from design to production and deployment. R.B.

N88-10608# NKF Engineering, Inc., Reston, VA.
**FIBER OPTIC ENGINEERING SENSOR SYSTEM.
PRELIMINARY PROGRAM MANAGEMENT PLAN, PHASE 3
REVISION**

Jul. 1987 36 p
(Contract N00014-87-C-2032)
(AD-A183663; NKF-87103-003/03-REV) Avail: NTIS HC
A03/MF A01 CSCL 17E

The principal objective of this program is to develop a Fiber Optic Engineering Sensor System (FOESS) including sensors, telemetry, and displays for applications such as damage control, system control (i.e., propulsion or steering) and intrusion defense systems for ship, aircraft and shore applications. This objective is being achieved by research and engineering effort conducted in three, originally four, contractually defined phases. GRA

N88-14062*# National Aeronautics and Space Administration, Washington, DC.

**ASTRONAUTICS AND AERONAUTICS, 1978: A CHRONOLOGY
BETTE R. JANSON** (Creative Resources and Planning, Fairfax, Va.) 1986 394 p *Its* NASA History Series
(Contract NASA ORDER W-73289)
(NASA-SP-4023; NAS 1.21:4023) Avail: SOD HC \$13.00 as
033-000-01010-9; NTIS MF A01 CSCL 05D

This is the 18th in a series of annual chronologies of significant events in the fields of astronautics and aeronautics. Events covered are international as well as national and political as well as scientific and technical. This series is a reference work for historians, NASA personnel, government agencies, congressional staffs, and the media. Author

N88-14155*# National Academy of Sciences - National Research Council, Washington, DC. Committee on the Status and Viability of Composite Materials for Aircraft Structures.

**ADVANCED ORGANIC COMPOSITE MATERIALS FOR
AIRCRAFT STRUCTURES: FUTURE PROGRAM**
1987 112 p

(Contract NASW-4003)
(NASA-CR-181467; NAS 1.26:181467) Avail: NTIS HC A06/MF
A01 CSCL 11D

Revolutionary advances in structural materials have been responsible for revolutionary changes in all fields of engineering. These advances have had and are still having a significant impact on aircraft design and performance. Composites are engineered materials. Their properties are tailored through the use of a mix or blend of different constituents to maximize selected properties of strength and/or stiffness at reduced weights. More than 20 years have passed since the potentials of filamentary composite materials were identified. During the 1970s much lower cost carbon filaments became a reality and gradually designers turned from boron to carbon composites. Despite progress in this field, filamentary composites still have significant unfulfilled potential for increasing aircraft productivity; the rendering of advanced organic composite materials into production aircraft structures was disappointingly slow. Why this is and research and technology development actions that will assist in accelerating the application of advanced organic composites to production aircraft is discussed. Author

N88-14926*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

**LANGLEY SYMPOSIUM ON AERODYNAMICS, VOLUME 1
SHARON H. STACK, comp.** Dec. 1986 592 p Symposium
held in Hampton, Va., 23-25 Apr. 1985
(NASA-CP-2397; L-16031; NAS 1.55:2397) Avail: NTIS HC
A25/MF A01 CSCL 01B

The purpose of this work was to present current work and results of the Langley Aeronautics Directorate covering the areas of computational fluid dynamics, viscous flows, airfoil aerodynamics, propulsion integration, test techniques, and low-speed, high-speed,

and transonic aerodynamics. The following sessions are included in this volume: theoretical aerodynamics, test techniques, fluid physics, and viscous drag reduction.

N88-14970*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.
**WIND SHEAR DETECTION. FORWARD-LOOKING SENSOR
TECHNOLOGY**

E. M. BRACALENTE, comp. and V. E. DELNORE, comp. (PRC Kentron, Inc., Hampton, Va.) Oct. 1987 282 p Presented at the 1st Industry Review, Hampton, Va., 24-25 Feb. 1987
(NASA-CP-10004; NAS 1.55:10004; DOT/FAA/PS-87/2) Avail:
NTIS HC A13/MF A01 CSCL 01C

A meeting took place at NASA Langley Research Center in February 1987 to discuss the development and eventual use of forward-looking remote sensors for the detection and avoidance of wind shear by aircraft. The participants represented industry, academia, and government. The meeting was structured to provide first a review of the current FAA and NASA wind shear programs, then to define what really happens to the airplane, and finally to give technology updates on the various types of forward-looking sensors. This document is intended to informally record the essence of the technology updates (represented here through unedited duplication of the vugraphs used), and the floor discussion following each presentation. Also given are key issues remaining unresolved. Author

N88-15096# Department of Energy, Washington, DC. Engineering and Geosciences Div.

SUMMARIES OF FY 1987 ENGINEERING RESEARCH
Nov. 1987 127 p

(DE88-002572; DOE/ER-0352) Avail: NTIS HC A07/MF A01
The Basic Energy Sciences (BES) Engineering Research program for fiscal year 1987 is presented; a summary is provided for each of the program projects in addition to a brief program overview. The report is intended to provide staff of Congressional committees, other executive departments, and other DOE offices with substantive program information so as to facilitate governmental overview and coordination of Federal research programs. Of equal importance, its availability facilitates communication of program information to interested research engineers and scientists. DOE

N88-15603*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

THE NASA AIRCRAFT ICING RESEARCH PROGRAM

ROBERT J. SHAW and JOHN J. REINMANN *In its* Aeropropulsion '87. Session 5: Subsonic Propulsion Technology 27 p Nov. 1987

Avail: NTIS HC A08/MF A01 CSCL 01C

The objective of the NASA aircraft icing research program is to develop and make available to industry icing technology to support the needs and requirements for all weather aircraft designs. Research is being done for both fixed and rotary wing applications. The NASA program emphasizes technology development in two key areas: advanced ice protection concepts and icing simulation (analytical and experimental). The computer code development/validation, icing wind tunnel testing, and icing flight testing efforts which were conducted to support the icing technology development are reviewed. Author

N88-16573# European Space Agency, European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

**THE APPROPRIATE USE OF CONTRACT TYPES IN
DEVELOPMENT CONTRACTS (A SYSTEMS APPROACH WITH
EMPHASIS ON THE EUROPEAN SPACE SECTOR)**

W. A. PEETERS and W. R. BURKE, ed. Oct. 1987 150 p
(ESA-STR-222; ISSN-0379-4067; ETN-88-91410) Avail: NTIS HC
A07/MF A01

A general contract model and its characteristics were established, while specific models for the three contractual parameters of major influence (cost, delivery time, and

performance) were developed. It is possible to establish specific formulas for cost and delivery incentives. Qualitative guidelines for performance and multiple incentives are presented. A model is presented in the form of a decision tree. This makes it possible to select objectively the most appropriate type of contract while taking into account the various environmental influencing factors together with the interests of client and contractor. The model and its underlying rationale help to bridge the communication gap that separates technical staff and contract administrators. ESA

N88-16578*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

FY87 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS, AND PRESENTATIONS

JOYCE E. TURNER, comp. Oct. 1987 63 p
(NASA-TM-100318; NAS 1.15:100318) Avail: NTIS HC A04/MF A01 CSCL 05B

The document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY87. It also includes papers of MSFC contractors. After being announced in STAR, all of the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22161. The information in this report may be of value to the scientific and engineering community in determining what information has been published and what is available. Author

N88-16625*# National Aeronautics and Space Administration, Washington, DC.

NASA/ARMY ROTORCRAFT TECHNOLOGY. VOLUME 1: AERODYNAMICS, AND DYNAMICS AND AEROELASTICITY

Feb. 1988 537 p Conference held at Moffett Field, Calif., 17-19 Mar. 1987

(NASA-CP-2495-VOL-1; NAS 1.55:2495-VOL-1) Avail: NTIS HC A23/MF A01 CSCL 01B

The Conference Proceedings is a compilation of over 30 technical papers presented at this milestone event which reported on the advances in rotorcraft technical knowledge resulting from NASA, Army, and industry rotorcraft research programs over the last 5 to 10 years. The Conference brought together over 230 government, industry, and allied nation conferees to exchange technical information and hear invited technical papers by prominent NASA, Army, and industry researchers covering technology topics which included: aerodynamics, dynamics and elasticity, propulsion and drive systems, flight dynamics and control, acoustics, systems integration, and research aircraft.

N88-16632*# National Aeronautics and Space Administration, Washington, DC.

NASA/ARMY ROTORCRAFT TECHNOLOGY. VOLUME 2: MATERIALS AND STRUCTURES, PROPULSION AND DRIVE SYSTEMS, FLIGHT DYNAMICS AND CONTROL, AND ACOUSTICS

Feb. 1988 587 p Conference held at Moffett Field, Calif., 17-19 Mar. 1987

(NASA-CP-2495-VOL-2; NAS 1.55:2495-VOL-2) Avail: NTIS HC A25/MF A01 CSCL 01B

The Conference Proceedings is a compilation of over 30 technical papers presented which report on the advances in rotorcraft technical knowledge resulting from NASA, Army, and industry research programs over the last 5 to 10 years. Topics addressed in this volume include: materials and structures; propulsion and drive systems; flight dynamics and control; and acoustics.

N88-16698*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

IMPACT AND PROMISE OF NASA AEROPROPULSION TECHNOLOGY

NEAL T. SAUNDERS and DAVID N. BOWDITCH *In its* Aeropropulsion '87. Session 1: Aeropropulsion Materials Research 30 p Nov. 1987

Avail: NTIS HC A06/MF A01 CSCL 21E

The aeropropulsion industry in the United States has established an enviable record of leading the world in aeropropulsion for commercial and military aircraft. The NASA aeropropulsion propulsion program (primarily conducted through the Lewis Research Center) has significantly contributed to that success through research and technology advances and technology demonstrations such as the Refan, Engine Component Improvement, and the Energy Efficient Engine Programs. Some past NASA contributions to engines in current aircraft are reviewed, and technologies emerging from current research programs for the aircraft of the 1990's are described. Finally, current program thrusts toward improving propulsion systems in the 2000's for subsonic commercial aircraft and higher speed aircraft such as the High-Speed Civil Transport and the National Aerospace Plane (NASP) are discussed. Author

N88-17261*# Michigan Univ., Ann Arbor. Robotics Research Lab.

SOFTWARE FOR INTEGRATED MANUFACTURING SYSTEMS, PART 1

A. W. NAYLOR and R. A. VOLZ *In* NASA. Lyndon B. Johnson Space Center, Houston, Texas, First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 397-398 Oct. 1987

Avail: NTIS HC A23/MF A01 CSCL 09B

For several years, a broad, unified approach to programming manufacturing cells, factory floors, and other manufacturing systems has been developed. It is based on a blending of distributed Ada, software components, generics and formal models. Among other things the machines and devices which make up the components, and the entire manufacturing cell is viewed as an assembly of software components. The purpose of this project is to reduce cost, increase the reliability and increase the flexibility of manufacturing software. An overview is given of the approach and an experimental generic factory floor controller that was developed using the approach is described. The controller is generic in the sense that it can control any one of a large class of factory floors making an arbitrary mix of parts. Author

N88-17262*# Michigan Univ., Ann Arbor. Robotics Research Lab.

SOFTWARE FOR INTEGRATED MANUFACTURING SYSTEMS, PART 2

R. A. VOLZ and A. W. NAYLOR *In* NASA. Lyndon B. Johnson Space Center, Houston, Texas, First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 399-403 Oct. 1987

Avail: NTIS HC A23/MF A01 CSCL 09B

Part 1 presented an overview of the unified approach to manufacturing software. The specific characteristics of the approach that allow it to realize the goals of reduced cost, increased reliability and increased flexibility are considered. Why the blending of a components view, distributed languages, generics and formal models is important, why each individual part of this approach is essential, and why each component will typically have each of these parts are examined. An example of a specification for a real material handling system is presented using the approach and compared with the standard interface specification given by the manufacturer. Use of the component in a distributed manufacturing system is then compared with use of the traditional specification with a more traditional approach to designing the system. An overview is also provided of the underlying mechanisms used for implementing distributed manufacturing systems using the unified software/hardware component approach. Author

N88-17833# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (Germany, F.R.). Engineering and Manufacturing Div.

COOPERATION KNOW-HOW IN HIGH-TECH PRODUCTS

HORST PREM *In its* Research and Development. Technical-Scientific Publications (1956-1987): Retrospective View and Prospects. Jubilee Edition on the Occasion of the 75th Anniversary of Dipl.-Engr. Dr.-Engr. E.H. Ludwig Boelkow p 99-106 1987 Presented at the Binational Conference on Asia-Pacific

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Dimensions of International Business: A Joint French-German Approach, Stuttgart, Fed. Republic of Germany, 16-17 Oct. 1986
Previously announced in IAA as A87-49966
(MBB-Z-101/86) Avail: NTIS HC A14/MF A01

The international cooperation of the German aerospace industry in the field of high-technology products is reviewed. The rationale for cooperation is explained. The technology targets for production, design, development, and basic research within Europe, with a view to the realization of competitive programs, are presented. Examples of international cooperation are given in order to demonstrate that the aerospace industry is a key factor in the international cooperation between industrialized nations. ESA

N88-19377*# Priem Consultants, Inc., Cleveland, OH.
STUDY OF INDUSTRY REQUIREMENTS THAT CAN BE FULFILLED BY COMBUSTION EXPERIMENTATION ABOARD SPACE STATION Final Contractor Report
RICHARD J. PRIEM Mar. 1988 62 p
(Contract NAS3-24105)
(NASA-CR-180854; E-3901; NAS 1.26:180854) Avail: NTIS HC A04/MF A01 CSCL 22A

The purpose of this study is to define the requirements of commercially motivated microgravity combustion experiments and the optimal way for space station to accommodate these requirements. Representatives of commercial organizations, universities and government agencies were contacted. Interest in and needs for microgravity combustion studies are identified for commercial/industrial groups involved in fire safety with terrestrial applications, fire safety with space applications, propulsion and power, industrial burners, or pollution control. From these interests and needs experiments involving: (1) no flow with solid or liquid fuels; (2) homogeneous mixtures of fuel and air; (3) low flow with solid or liquid fuels; (4) low flow with gaseous fuel; (5) high pressure combustion; and (6) special burner systems are described and space station resource requirements for each type of experiment provided. Critical technologies involving the creation of a laboratory environment and methods for combining experimental needs into one experiment in order to obtain effective use of space station are discussed. Diagnostic techniques for monitoring combustion process parameters are identified. Author

N88-20176# Ministry of Defence, London (England).
PICKING WINNERS: PARAMETRIC COST ESTIMATING AND PROJECT MANAGEMENT
P. G. PUGH *In* AGARD. Flight Vehicle Development Time and Cost Reduction 21 p Sep. 1987
Avail: NTIS HC A14/MF A01

Project managers and development engineers might well be excused for thinking that they have more than enough cost estimates already. After all, the content of any major development program is always broken down into numerous work packages and the cost of these individually estimated in fine detail. Then, as the work proceeds, these very detailed bottom-up estimates are continually refined and have a large claim on the attention of project managers. However, there is another form of cost estimating which can be used from the very inception of a project and which brings large returns from modest effort. Traditional methods assist attempts to control the costs of an on-going project towards some pre-set target. The methods described here are directed more at the initial selection of projects and the setting of feasible cost targets for them. In brief, their role is to pick winners from the range of competing alternatives which present themselves before a major project is begun. At the least, these methods give greater assurance that the chosen solution will be viable in terms of its being attempted within realistic cost restraints. Author

N88-20189# Boeing Military Airplane Development, Wichita, KS. Manufacturing Technology.
PROTOTYPE MANUFACTURING TECHNIQUES FOR REDUCING COST, SCHEDULE, AND TECHNICAL RISK
M. SCOTT SCHUESSLER and JOSEPH C. WILLIAMS *In* AGARD. Flight Vehicle Development Time and Cost Reduction 14 p Sep.

1987
Avail: NTIS HC A14/MF A01

Programs involving the manufacture of prototype hardware offer rewards to those companies willing to accept the challenge. Boeing Military Aircraft Company (BMAC) has excelled at meeting these challenges with a proven record of successful development programs. In addition, future programs will use neoteric technologies and disciplines such as Computer-Integrated Manufacturing (CIM) to direct and integrate all required fabrication and assembly processes. Logic, innovation blended with tradition, and careful planning are the keys to BMAC's success. Author

N88-20195# Aeronautica Macchi S.p.A., Varese (Italy).
ENGINEERING MANAGEMENT FOR VALIDATION PROTOTYPE PHASE
ALESSANDRO NEVIANI *In* AGARD. Flight Vehicle Development Time and Cost Reduction 11 p Sep. 1987
Avail: NTIS HC A14/MF A01

The success and effectiveness of a concept of demonstration-validation through the use of prototypes depend essentially on the contractor's engineering management activities, which must be carefully tailored to the goals of the program. Special importance goes to the activities for the definition of the most cost-effective prototype configuration, of planning, coordination and integration of the different specialty areas, of reduction and simplification of the formal qualification documentation and decision processes. This requires that the customer include flexibility in his contract, and that the contractor adapt his organization by establishing an efficient task force led by a dedicated system engineering structure. Essential factors for success are also a correct choice of key people for the organizational structure, and the completeness of the conceptual studies representing a basis for realistic planning of the prototype definition, development and evaluation activities. The evaluation of the benefits obtainable in terms of complete development costs and time by using the suggested policies and techniques can be qualitative only, significant and homogeneous comparison data being scarce. Author

N88-20224*# Kansas Univ. Center for Research, Inc., Lawrence. Industrial Innovation Lab.
A PROJECT TO TRANSFER TECHNOLOGY FROM NASA CENTERS IN SUPPORT OF INDUSTRIAL INNOVATION IN THE MIDWEST Final Report
B. G. BARR Apr. 1986 21 p
(Contract NASW-3438)
(NASA-CR-180360; NAS 1.26:180360; FR-5040) Avail: NTIS HC A03/MF A01 CSCL 05A

A technology transfer program utilizing graduate students in mechanical engineering at the University of Kansas was initiated in early 1981. The objective of the program was to encourage industrial innovation in the Midwest through improved industry/university cooperation and the utilization of NASA technology. A related and important aspect of the program was the improvement of graduate engineering education through the involvement of students in the identification and accomplishment of technological objectives in cooperation with scientists at NASA centers and engineers in industry. The pilot NASA/University Industrial Innovation Program was an outstanding success based on its ability to: attract top graduate students; secure industry support; and stimulate industry/university cooperation leading to enhanced university capability and utilization of advanced technology by industry. B.G.

N88-22902*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
NASA ADVANCED TURBOPROP RESEARCH AND CONCEPT VALIDATION PROGRAM
JOHN B. WHITLOW, JR. and G. KEITH SIEVERS 1988 23 p
Proposed for presentation at the 1988 Conference and Exposition on Future Transportation Technology, San Francisco, Calif., 8-11 Aug. 1988; sponsored by the Society of Automotive Engineers

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(NASA-TM-100891; E-4129; NAS 1.15:100891) Avail: NTIS HC A03/MF A01 CSCL 21E

NASA has determined by experimental and analytical effort that use of advanced turboprop propulsion instead of the conventional turbofans in the older narrow-body airline fleet could reduce fuel consumption for this type of aircraft by up to 50 percent. In cooperation with industry, NASA has defined and implemented an Advanced Turboprop (ATP) program to develop and validate the technology required for these new high-speed, multibladed, thin, swept propeller concepts. This paper presents an overview of the analysis, model-scale test, and large-scale flight test elements of the program together with preliminary test results, as available. Author

N88-22906# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH.

STABILITY AND CONTROL METHODOLOGY FOR CONCEPTUAL AIRCRAFT DESIGN. VOLUME 1: METHODOLOGY MANUAL Final Report, Jun. 1985 - Jun. 1987
TERRY S. SMITH Dec. 1987 179 p
(AD-A191314; AFWAL-TR-87-3115-VOL-1) Avail: NTIS HC A09/MF A01 CSCL 01A

This report contains methodology for predicting stability and control characteristics of conceptual flight vehicles. The methodology presented is a combination of existing methodology, modified existing methodology, and newly developed methodology. The methodology is divided into three main sections: (1) Aerodynamics of Longitudinal stability coefficients, (2) Lateral Stability coefficients, and (3) Static and Dynamic Stability Analysis. GRA

N88-23684# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

DATA MANAGEMENT STRATEGIES IN THE INDUSTRIAL ENVIRONMENT
R. P. DEMOEL and F. J. HEEREMA 8 Jan. 1987 24 p In DUTCH; ENGLISH summary Presented at CAPE Nederland '87, Amsterdam, The Netherlands, 17-19 Mar. 1987
(NLR-MP-87002-U; B8731727; ETN-88-92227) Avail: NTIS HC A03/MF A01

Use of data management technology by industry is discussed. Working methods, responsibilities and habits, confidence in automation, and panic related to own status are considered. ESA

N88-23726*# Princeton Univ., NJ. Dept. of Mechanical and Aerospace Engineering.

IT'S TIME TO REINVENT THE GENERAL AVIATION AIRPLANE
ROBERT F. STENGEL In NASA, Langley Research Center, Joint University Program for Air Transportation Research, 1986 p 81-105 Apr. 1988
Avail: NTIS HC A06/MF A01 CSCL 01C

Current designs for general aviation airplanes have become obsolete, and avenues for major redesign must be considered. New designs should incorporate recent advances in electronics, aerodynamics, structures, materials, and propulsion. Future airplanes should be optimized to operate satisfactorily in a positive air traffic control environment, to afford safety and comfort for point-to-point transportation, and to take advantage of automated manufacturing techniques and high production rates. These requirements have broad implications for airplane design and flying qualities, leading to a concept for the Modern Equipment General Aviation (MEGA) airplane. Synergistic improvements in design, production, and operation can provide a much needed fresh start for the general aviation industry and the traveling public. In this investigation a small four place airplane is taken as the reference, although the proposed philosophy applies across the entire spectrum of general aviation. Author

N88-23764# General Accounting Office, Washington, DC.
NATIONAL AERO-SPACE PLANE: A TECHNOLOGY DEVELOPMENT AND DEMONSTRATION PROGRAM TO BUILD THE X-30

Apr. 1988 80 p
(GAO/NSIAD-88-122; AD-A192698) Avail: NTIS HC A05/MF A01

The National Aero-Space Plane (NASP) Program is a joint DOD/NASA technology development and demonstration program to build and test the X-30 experimental flight vehicle. The X-30 is designed to take off horizontally from a conventional runway, reach hypersonic speeds up to Mach 25, attain low Earth orbit, and return to land on a conventional runway. The X-30 would fly 10 times faster and higher than existing air-breathing aircraft. The NASP Program is described and a status report of X-30 development provided, including the following: (1) goals and objectives; (2) program costs and schedule estimates; (3) key technological developments, integration, and risks; (4) potential military, space, and commercial mission applications; (5) program management and acquisition; and (6) alternatives and international aerospace development efforts. Author

N88-23823# Science Applications International Corp., McLean, VA.

SOVIET SPACECRAFT ENGINEERING RESEARCH
J. F. GARIBOTTI, M. ASWANI, E. F. CRAWLEY, W. C. KESSLER, K. SOOSAAR, J. D. TURNER, and W. P. WITT Oct. 1987 164 p
(FASAC-TAR-3090) Avail: NTIS HC A08/MF A01

The Soviet published literature in spacecraft engineering pertaining to future space systems, including those utilizing large structures is assessed. Topical areas emphasized include advanced structural concepts and associated construction approaches, spacecraft materials, precision pointing and rapid retargeting, geometrically precise structures in the presence of static and dynamic disturbances, and spacecraft vulnerability as it relates to these aspects of spacecraft engineering. The assessment indicates that the Soviets have significant strengths and specialties in spacecraft engineering. The Soviet space station appears to be the principal Soviet large system of the near future, and this will expand and evolve in size and capability. Radio astronomy missions are also genuine drivers for large space structure technology, including space construction capability. In the structural materials area, the Soviets can be expected to develop high quality, structurally efficient fiber-reinforced metal-matrix composites, which will be used to improve the performance and possibly the survivability of future Soviet spacecraft. The technology of control-structure interaction, important in the design of large space-based lasers, is receiving considerably more support, based on the published literature, in the United States than in the Soviet Union. Author

N88-24002*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ENGINE STRUCTURES: A BIBLIOGRAPHY OF LEWIS RESEARCH CENTER'S RESEARCH FOR 1980-1987
Apr. 1988 212 p Compiled by the Committee for LST 88, the Lewis Structures Technology Symposium and Exposition, Cleveland, Ohio, 24-25 May 1988
(NASA-TM-100842; E-4033; NAS 1.15:100842) Avail: NTIS HC A01/MF A01 CSCL 20K

This compilation of abstracts describes and indexes the technical reporting that resulted from the scientific and engineering work performed and managed by the Structures Division of the NASA Lewis Research Center from 1980 through 1987. All the publications were announced in the 1980 to 1987 issues of STAR (Scientific and Technical Aerospace Reports) and or IAA (International Aerospace Abstracts). Included are research reports, journal articles, conference presentations, patents and patent applications, and theses. Author

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N88-24641*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

NASA/INDUSTRY ADVANCED TURBOPROP TECHNOLOGY PROGRAM

JOSEPH A. ZIEMIANSKI and JOHN B. WHITLOW, JR. 1988 26 p Prepared for presentation at the 16th Congress of the International Council of Aeronautical Sciences, Jerusalem, Israel, 28 Aug. - 2 Sep. 1988 (NASA-TM-100929; E-4198; NAS 1.15:100929) Avail: NTIS HC A03/MF A01 CSCL 21E

Experimental and analytical effort shows that use of advanced turboprop (propfan) propulsion instead of conventional turboprops in the older narrow-body airline fleet could reduce fuel consumption for this type of aircraft by up to 50 percent. The NASA Advanced Turboprop (ATP) program was formulated to address the key technologies required for these thin, swept-blade propeller concepts. A NASA, industry, and university team was assembled to develop and validate applicable design codes and prove by ground and flight test the viability of these propeller concepts. Some of the history of the ATP project, an overview of some of the issues, and a summary of the technology developed to make advanced propellers viable in the high-subsonic cruise speed application are presented. The ATP program was awarded the prestigious Robert J. Collier Trophy for the greatest achievement in aeronautics and astronautics in America in 1987. Author

N88-26572# National Bureau of Standards, Gaithersburg, MD. Center for Electronics and Electrical Engineering.

CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL PUBLICATION ANNOUNCEMENTS COVERING CENTER PROGRAMS, JULY TO SEPTEMBER 1987

E. J. WALTERS Apr. 1988 27 p (PB88-196530; NBSIR-88/3748) Avail: NTIS HC A03/MF A01 CSCL 09C

This is the fourteenth issue of a quarterly publication providing information on the technical work of the National Bureau of Standards Center for Electronics and Electrical Engineering. The issue of the Center for Electronics and Electrical Engineering Technical Publication Announcements covers the third quarter of calendar year 1987. Abstracts are provided by technical area for papers published this quarter. Author

N88-27756# Office of Science and Technology, Washington, DC.

FEDERAL COUNCIL ON SCIENCE, ENGINEERING AND TECHNOLOGY: COMMITTEE ON COMPUTER RESEARCH AND APPLICATIONS, SUBCOMMITTEE ON SCIENCE AND ENGINEERING COMPUTING: THE US SUPERCOMPUTER INDUSTRY

Dec. 1987 180 p (DE88-011262; DOE/ER-0362) Avail: NTIS HC A09

The Federal Coordinating Council on Science, Engineering, and Technology (FCCSET) Committee on Supercomputing was chartered by the Director of the Office of Science and Technology Policy in 1982 to examine the status of supercomputing in the United States and to recommend a role for the Federal Government in the development of this technology. In this study, the FCCSET Committee (now called the Subcommittee on Science and Engineering Computing of the FCCSET Committee on Computer Research and Applications) reports on the status of the supercomputer industry and addresses changes that have occurred since issuance of the 1983 and 1985 reports. The review based on periodic meetings with and site visits to supercomputer manufacturers and consultation with experts in high performance scientific computing. White papers have been contributed to this report by industry leaders and supercomputer experts. DOE

N88-27813# Iowa Univ., Iowa City. Optimal Design Lab. **DATABASE DESIGN AND MANAGEMENT IN ENGINEERING OPTIMIZATION Final Technical Report, Oct. 1982 - Feb. 1988** JASBIR S. ARORA Feb. 1988 151 p (Contract AF AFOSR-0322-82)

(AD-A193325; ODL-88.2; AFOSR-88-0366TR) Avail: NTIS HC A08/MF A01 CSCL 12G

In this report, the research completed under the project in the area of database management in engineering design and optimization is described. Database management concepts used in business applications were studied and concepts suitable for engineering applications were developed. Data structures that need to be managed were identified. Database design methodologies were studied and a suitable methodology for engineering designs and optimization applications was developed. Several prototype database management systems (DBMS) were designed, developed and evaluated. Several prototype application programs utilizing a database management were developed to evaluate performance of DBMS. Based on these implementations and studies, the usual relational data model was generalized to handle engineering data types. Specifications for an integrated DBMS capable of handling relations, vectors and matrices (of different types) were developed. A system based on the specifications, called MIDAS/GR was implemented and evaluated. MIDAS/GR stands for Management of Information for Design and Analysis of Systems/Generalized Relational Model. GRA

N88-28802# Rolls-Royce Ltd., Derby (England). **ADVANCED MANUFACTURING MANAGEMENT CURRENT AND FORTHCOMING TECHNOLOGIES**

DEREK HATHAWAY 3 Dec. 1987 21 p Presented at a conference, Derby, United Kingdom, 3 Dec. 1987 (PNR90445; ETN-88-92679) Avail: NTIS HC A03/MF A01

Computer aided engineering; manufacturing control; computer aided logistics; semiconductors; data storage; vector and parallel processing; fourth generation languages; industry standards for computer systems; and computer aided design and manufacturing are reviewed. ESA

N88-28915*# Douglas Aircraft Co., Inc., Long Beach, CA.

CRITICAL JOINTS IN LARGE COMPOSITE PRIMARY AIRCRAFT STRUCTURES. VOLUME 2: TECHNOLOGY DEMONSTRATION TEST REPORT

BRUCE L. BUNIN Jun. 1985 209 p (Contract NAS1-16857) (NASA-CR-172587; NAS 1.26:172587; ACEE-26-TR-3478-VOL-2) Avail: NTIS HC A10/MF A01 CSCL 01C

A program was conducted to develop the technology for critical structural joints in composite wing structure that meets all the design requirements of a 1990 commercial transport aircraft. The results of four large composite multirow bolted joint tests are presented. The tests were conducted to demonstrate the technology for critical joints in highly loaded composite structure and to verify the analytical methods that were developed throughout the program. The test consisted of a wing skin-stringer transition specimen representing a stringer runout and skin splice on the wing lower surface at the side of the fuselage attachment. All tests were static tension tests. The composite material was Toray T-300 fiber with Ciba-Geigy 914 resin in 10 mil tape form. The splice members were metallic, using combinations of aluminum and titanium. Discussions are given of the test article, instrumentation, test setup, test procedures, and test results for each of the four specimens. Some of the analytical predictions are also included. Author

N88-28916*# Douglas Aircraft Co., Inc., Long Beach, CA.

CRITICAL JOINTS IN LARGE COMPOSITE PRIMARY AIRCRAFT STRUCTURES. VOLUME 3: ANCILLARY TEST RESULTS

BRUCE L. BUNIN and R. L. SAGUI Washington, D.C. Jun. 1985 338 p (Contract NAS1-16857) (NASA-CR-172588; NAS 1.26:172588; ACEE-26-TR-3958A-VOL-3) Avail: NTIS HC A15/MF A01 CSCL 01C

A program was conducted to develop the technology for critical structural joints for composite wing structure that meets all the design requirements of a 1990 commercial transport aircraft. The

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results of a comprehensive ancillary test program are summarized, consisting of single-bolt composite joint specimens tested in a variety of configurations. These tests were conducted to characterize the strength and load deflection properties that are required for multirow joint analysis. The composite material was Toray 300 fiber and Ciba-Geigy 914 resin, in the form of 0.005 and 0.01 inch thick unidirectional tape. Tests were conducted in single and double shear for loaded and unloaded hole configurations under both tensile and compressive loading. Two different layup patterns were examined. All tests were conducted at room temperature. In addition, the results of NASA Standard Toughness Test (NASA RP 1092) are reported, which were conducted for several material systems. Author

N88-28983*# Douglas Aircraft Co., Inc., Long Beach, CA.
CRITICAL JOINTS IN LARGE COMPOSITE PRIMARY AIRCRAFT STRUCTURES. VOLUME 1: TECHNICAL SUMMARY Final Report
BRUCE L. BUNIN Sep. 1985 64 p
(Contract NAS1-16857)
(NASA-CR-3914; NAS 1.26:3914; ACEE-26-FR-3504) Avail:
NTIS HC A04/MF A01 CSDL 11D

A program was conducted at Douglas Aircraft Company to develop the technology for critical joints in composite wing structure that meets all the design requirements of a 1990 commercial transport aircraft. In fulfilling this objective, analytical procedures for joint design and analysis were developed during Phase 1 of the program. Tests were conducted at the element level to supply the empirical data required for methods development. Large composite multirow joints were tested to verify the selected design concepts and for correlation with analysis predictions. The Phase 2 program included additional tests to provide joint design and analysis data, and culminated with several technology demonstration tests of a major joint area representative of a commercial transport wing. The technology demonstration program of Phase 2 is discussed. The analysis methodology development, structural test program, and correlation between test results and analytical strength predictions are reviewed. Author

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ROBOTICS AND EXPERT SYSTEMS

Includes Artificial Intelligence, Robots and Robotics, Automatic Control and Cybernetics, Expert Systems, Automation Applications, Computer-Aided Design (CAD), Computer-Aided Manufacturing.

A88-10437
ROBOTIC AIR VEHICLE - A PILOT'S PERSPECTIVE
JESSE BLAIR (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) and KARL E. SCHRICKER (Texas Instruments, Inc., Dallas) IEEE Aerospace and Electronic Systems Magazine (ISSN 0885-8985), vol. 2, Sept. 1987, p. 8-11.

The algorithms and technological features needed to develop robotic air vehicles (RAVs) are examined. The proposed RAV is an unmanned air vehicle capable of passive terrain following, terrain avoidance, obstacle avoidance, and autonomous navigation. The need to combine the remotely piloted vehicle airframe and propulsion concept with AI is discussed. RAV simulations and demonstrations have been designed. The simulations will evaluate the functioning of the RAV software algorithms during various mission scenarios, and the demonstrations will test the ability of RAVs to fly a jet aircraft, execute an instrument/qualification check, a mission ready check, and a tactical qualification check. I.F.

A88-15285
CAMERA EXPERT SYSTEM FOR SPACE STATION COMMUNICATIONS AND TRACKING SYSTEM MANAGEMENT
MICHAEL CRONE and PAUL JULICH (Harris Corp., Melbourne,

FL) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 14 p. refs

This paper describes research into the use of expert system technology for the management of the communications and tracking system for the Space Station. The CAMERA (Control and Monitor Equipment Resource Allocation) Expert System was developed to minimize crew workload in managing the communications of the Space Station. The system has been implemented (under NASA contract) for use on a testbed at JSC. The system utilizes a state-of-the-art man-machine interface to allow high-level end-to-end service requests. Author

A88-15300* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
BUILDING INTELLIGENT SYSTEMS - ARTIFICIAL INTELLIGENCE RESEARCH AT NASA AMES RESEARCH CENTER

PETER FRIEDLAND and HENRY LUM (NASA, Ames Research Center, Moffett Field, CA) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 7 p.

The basic components that make up the goal of building autonomous intelligent systems are discussed, and ongoing work at the NASA Ames Research Center is described. It is noted that a clear progression of systems can be seen through research settings (both within and external to NASA) to Space Station testbeds to systems which actually fly on the Space Station. The starting point for the discussion is a 'truly' autonomous Space Station intelligent system, responsible for a major portion of Space Station control. Attention is given to research in fiscal 1987, including reasoning under uncertainty, machine learning, causal modeling and simulation, knowledge from design through operations, advanced planning work, validation methodologies, and hierarchical control of and distributed cooperation among multiple knowledge-based systems. B.J.

A88-15816*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NASA'S TELEROBOTICS R & D PROGRAM - STATUS AND FUTURE DIRECTIONS
DONNA SHIRLEY PIVROTTO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and GIULIO VARSÌ (NASA, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. refs
(Contract NAS7-918)
(IAF PAPER 87-24)

NASA's telerobotics technology program is described as well as the process for the transfer of this technology to the Space Station, and some of the implications of the technology for station design and operations, including those for international cooperation. A diagram is presented of the NASREM control hierarchy with the Office of Aeronautics and Space Technology telerobot testbed architecture superimposed. In telerobotics, the following areas were identified as possible subjects for developing data to support international standards: (1) task boards, (2) system performance measures on task boards, (3) human performance measures on task boards with teleoperation, and (4) autonomous-telerobotically teleoperated performance comparisons. K.K.

A88-15822#
APPLICABILITY OF A.I. TECHNIQUES TO THE SPACE STATION, A STUDY CASE - DEVELOPMENT OF AN EXPERT SYSTEM FOR ON BOARD FAULT MANAGEMENT
R. PERSICO, P. DONZELLI, F. LONGONI (Laben - Industrie per lo Spazio e le Comunicazioni S.p.A., Vimodrone, Italy), and G. ROCCA (Quinary, Milan, Italy) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 7 p. refs
(IAF PAPER 87-30)

Results are presented from a feasibility study of AI fault diagnosis aboard the Space Station. The evolution of AI capabilities in recent years is reviewed; the main goals of AI development for

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the Space Station are outlined; and specific tasks for expert systems in the crew work station are discussed, including system and subsystem operation and management, payload operation and management, support for telepresence and active research, and mission planning and timelining. An expert-system architecture is then worked out for the case of the Processor Interface Adaptor: the methodological approach, knowledge base, inference engine, user interface, and development environment definition are characterized in detail and illustrated with diagrams. The architecture developed is found to be a first step in (1) reducing crew workload while maintaining crew authority and visibility and (2) meeting hardware documentation needs. T.K.

A88-16999* Stanford Univ., CA.
EXPERIMENTS IN ADVANCED CONTROL CONCEPTS FOR SPACE ROBOTICS - AN OVERVIEW OF THE STANFORD AEROSPACE ROBOTICS LABORATORY

M. G. HOLLARS, R. H. CANNON, JR., H. L. ALEXANDER, and D. F. MORSE (Stanford University, CA) IN: Guidance and control 1987; Proceedings of the Annual Rocky Mountain Guidance and Control Conference, Keystone, CO, Jan. 31-Feb. 4, 1987. San Diego, CA, Univelt, Inc., 1987, p. 417-434. NASA-supported research. refs
(Contract F49620-82-C-00092; F33615-85-C-5106; F33615-82-K-5108; MDA903-86-K-0037)
(AAS PAPER 87-044)

The Stanford University Aerospace Robotics Laboratory is actively developing and experimentally testing advanced robot control strategies for space robotic applications. Early experiments focused on control of very lightweight one-link manipulators and other flexible structures. The results are being extended to position and force control of mini-manipulators attached to flexible manipulators and multilink manipulators with flexible drive trains. Experimental results show that end-point sensing and careful dynamic modeling or adaptive control are key to the success of these control strategies. Free-flying space robot simulators that operate on an air cushion table have been built to test control strategies in which the dynamics of the base of the robot and the payload are important. Author

A88-19885
DEVELOPMENT OF AN EXPERT INVESTMENT STRATEGY SYSTEM FOR AEROSPACE RD&E AND PRODUCTION CONTRACT BIDDING

G. R. MADEY, J. POTTER (Kent State University, OH), and M. H. WOLFE (Goodyear Aerospace Corp., Akron, OH) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. EM-34, Nov. 1987, p. 252-258. refs

A small expert system developed in an aerospace firm is described. The expert system, called INSTRAT, assists managers with investment decisions associated with R&D, engineering, and production contract bidding. These decisions are a frequent and bothersome problem within the firm. INSTRAT is also used for training new staff and as a computerized 'road map' or checklist for the more experienced managers. The expert system was written using the OPS5 development language and consists of almost two hundred rules. A survey of artificial intelligence (AI), expert systems (ES), expert support systems (ESS), and the OPS5 language is provided with emphasis on engineering management applications. The artificial intelligence/expert systems model building approach was found to produce a satisfactory decision aid for the firm's managers. This approach was evaluated to be as good as or better than the more traditional operations research, management science, or decision support system approaches for the investment decision problem described in the paper. Author

A88-21620
INTELLIGENT ROBOTS AND COMPUTER VISION; PROCEEDINGS OF THE FIFTH MEETING, CAMBRIDGE, MA, OCT. 28-31, 1986

DAVID P. CASASANT, ED. (Carnegie-Mellon University, Pittsburgh, PA) Meeting sponsored by SPIE. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings.

Volume 726), 1987, 598 p. For individual items see A88-21621 to A88-21629.
(SPIE-726)

Major topics and new areas of work in intelligent robots and computer vision research are examined. The general topics addressed include: pattern recognition for computer vision, image processing for intelligent robotics, depth and motion in three-dimensional vision, modeling and shape estimation in three-dimensional vision, symbolic processing of visual information, robotic sensors and applications, intelligent control architectures for robot systems, robot languages and programing, human-machine interfaces, systems and architectures for robotics. C.D.

A88-21631
SPACE STATION AUTOMATION II; PROCEEDINGS OF THE MEETING, CAMBRIDGE, MA, OCT. 28-30, 1986

WUN C. CHIYOU, SR., ED. (Lockheed Research Laboratories, Palo Alto, CA) Meeting sponsored by SPIE. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 729), 1987, 275 p. For individual items see A88-21632 to A88-21660.
(SPIE-729)

Various papers on Space Station (SS) automation are presented. Individual topics addressed include: automation and robotics for the SS; controlling real-time processes on the SS with expert systems; communicating expert systems in fault diagnosis for SS applications; automatic planning research applied to orbital construction; NASA systems autonomy demonstration program; autonomy, automation, and systems; autonomous management of the SS electric energy system; design knowledge capture for the SS; translation and execution of distributed Ada programs; knowledge-based mission sequencing; passive optically encoded transponder; orbiting control station for free-flying teleoperators; system architecture for telerobotic servicing and assembly tasks. Also discussed are: computing architecture for telerobots in earth orbit; NASA telerobot technology demonstrator; launching a commercial space industry; Solar Maximum Mission repair; implementation of expert system technology on the SS; video-based satellite attitude determination; cooperative human-machine fault diagnosis. C.D.

A88-21632* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

USE OF AUTOMATION AND ROBOTICS FOR THE SPACE STATION

AARON COHEN (NASA, Johnson Space Center, Houston, TX) IN: Space Station automation II; Proceedings of the Meeting, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 2-6.

An overview is presented of the various possible applications of automation and robotics technology to the Space Station system. The benefits of such technology to the private sector and the national economy are addressed. NASA's overall approach to incorporating advanced technology into the Space Station is examined. C.D.

A88-21633
COOPERATING EXPERT SYSTEMS FOR SPACE STATION POWER DISTRIBUTION MANAGEMENT

T. A. NGUYEN and W. C. CHIYOU, SR. (Lockheed Artificial Intelligence Center, Palo Alto, CA) IN: Space Station automation II; Proceedings of the Meeting, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 7-10. refs

A software program called CARTS (cooperating ART-based systems) is described which addresses the problem of communications between expert systems aboard the International Space Station. The CARTS architecture and implementation are described. An Automated Power Management System for the Space Station is also discussed. C.D.

A88-21639* Texas Christian Univ., Fort Worth.

NASA SYSTEMS AUTONOMY DEMONSTRATION PROGRAM - A STEP TOWARD SPACE STATION AUTOMATION

S. A. STARKS (Texas Christian University, Fort Worth), D. RUNDUS (South Florida, University, Tampa, FL), W. K. ERICKSON (NASA, Ames Research Center, Moffett Field, CA), and K. J. HEALEY (NASA, Johnson Space Center, Houston, TX) IN: Space Station automation II; Proceedings of the Meeting, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 80-85.

This paper addresses a multiyear NASA program, the Systems Autonomy Demonstration Program (SADP), whose main objectives include the development, integration, and demonstration of automation technology in Space Station flight and ground support systems. The role of automation in the Space Station is reviewed, and the main players in SADP and their roles are described. The core research and technology being promoted by SADP are discussed, and a planned 1988 milestone demonstration of the automated monitoring, operation, and control of a complete mission operations subsystem is addressed. C.D.

A88-21651* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE NASA TELEROBOT TECHNOLOGY DEMONSTRATOR

P. S. SCHENKER, R. L. FRENCH, A. R. SIROTA, and J. R. MATIJEVIC (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Space Station automation II; Proceedings of the Meeting, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 178-188. refs

The ongoing development of a telerobot technology demonstrator is reported. The demonstrator is implemented as a laboratory-based research testbed, and will show proof-of-concept for supervised automation of space assembly, servicing, and repair operations. The demonstrator system features a hierarchically layered intelligent control architecture which enables automated planning and run-time sequencing of complex tasks by a supervisory human operator. The demonstrator also provides a full bilateral force-reflecting hand control teleoperations capability. The operator may switch smoothly between the automated and teleoperated tasking modes in run-time, either on a preplanned or operator-designated basis. Author

A88-22696* Apogee Research Corp., San Diego, CA.

EXPERT SYSTEMS FOR SPACE POWER SUPPLY - DESIGN, ANALYSIS, AND EVALUATION

RALPH S. COOPER (Apogee Research Corp., San Diego, CA), M. KEMER THOMSON, and ALAN HOSHOR (Q-Systems, San Diego, CA) IN: Space nuclear power systems 1986; Proceedings of the Third Symposium, Albuquerque, NM, Jan. 13-16, 1986. Malabar, FL, Orbit Book Co., Inc., 1987, p. 259-266. refs (Contract NAS3-23900)

The feasibility of applying expert systems to the conceptual design, analysis, and evaluation of space power supplies in particular, and complex systems in general is evaluated. To do this, the space power supply design process and its associated knowledge base were analyzed and characterized in a form suitable for computer emulation of a human expert. The existing expert system tools and the results achieved with them were evaluated to assess their applicability to power system design. Some new concepts for combining program architectures (modular expert systems and algorithms) with information about the domain were applied to create a 'deep' system for handling the complex design problem. NOVICE, a code to solve a simplified version of a scoping study of a wide variety of power supply types for a broad range of missions, has been developed, programmed, and tested as a concrete feasibility demonstration. Author

A88-24230* National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

PROCESSES IN CONSTRUCTION OF FAILURE MANAGEMENT EXPERT SYSTEMS FROM DEVICE DESIGN INFORMATION

JANE T. MALIN and NICK LANCE (NASA, Johnson Space Center,

Houston, TX) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-17, Nov.-Dec. 1987, p. 956-967. refs

This paper analyzes the tasks and problem solving methods used by an engineer in constructing a failure management expert system from design information about the device to be diagnosed. An expert test engineer developed a trouble-shooting expert system based on device design information and experience with similar devices, rather than on specific expert knowledge gained from operating the device or troubleshooting its failures. The construction of the expert system was intensively observed and analyzed. This paper characterizes the knowledge, tasks, methods, and design decisions involved in constructing this type of expert system, and makes recommendations concerning tools for aiding and automating construction of such systems. Author

A88-31644

ADVANCES IN DESIGN AUTOMATION - 1987. VOLUME 1 - DESIGN METHODS, COMPUTER GRAPHICS, AND EXPERT SYSTEMS; PROCEEDINGS OF THE THIRTEENTH ANNUAL DESIGN AUTOMATION CONFERENCE, BOSTON, MA, SEPT. 27-30, 1987

S. S. RAO, ED. (Purdue University, West Lafayette, IN) Conference sponsored by ASME. New York, American Society of Mechanical Engineers, 1987, 439 p. For individual items see A88-31645 to A88-31647.

Topics discussed include optimal design theory and applications, mechanism optimization, design methods, and design and assembly. Attention is also given to intelligent design and manufacturability, computer graphics and design, and expert systems and artificial intelligence. B.J.

A88-31648

ADVANCES IN DESIGN AUTOMATION - 1987. VOLUME 2 - ROBOTICS, MECHANISMS, AND MACHINE SYSTEMS; PROCEEDINGS OF THE THIRTEENTH ANNUAL DESIGN AUTOMATION CONFERENCE, BOSTON, MA, SEPT. 27-30, 1987

S. S. RAO, ED. (Purdue University, West Lafayette, IN) Conference sponsored by ASME. New York, American Society of Mechanical Engineers, 1987, 467 p. For individual items see A88-31649 to A88-31653.

Papers are presented on such topics as electro-rheological-fluid-based articulating robotic systems, the shape optimum design of robotic manipulators with static performance criteria, the automated modeling and rapid solution of robot dynamics using the symbolic polynomial technique, and the dynamic and kinematic analyses of a multilegged robotic vehicle. Consideration is also given to the synthesis of harmonic motion generating linkages, the dynamic modeling and analysis of general linked mechanisms with compliance, the simulation of planar dynamic mechanical systems with changing topologies, and a substructure technique for the dynamics of flexible mechanical systems with contact-impact. B.J.

A88-32522

APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN JAPAN

NAKAJI HONDA (University of Electro-Communications, Tokyo, Japan) and ARIO OHSATO (Yokohama National University, Japan) Telematics and Informatics (ISSN 0736-5853), vol. 5, no. 1, 1988, p. 39-52. refs

This article presents a comprehensive report on the recent research and development of artificial intelligence (AI) in Japan, focusing especially on industrial applications. First, historical background of AI research and the future trends of AI Marketing in Japan are reported. Then, industrial applications of AI are introduced with respect to three fields: expert systems, machine translation, and applications of fuzzy set theory. Finally, problems for future research projects are outlined. Author

A88-34205

A KNOWLEDGE BASED APPROACH TO STRATEGIC ON-BOARD MISSION MANAGEMENT

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GEORGE F. WILBER (Boeing Military Airplane Co., Seattle, WA) IN: NAECON 87; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1987. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 1377-1381.

The author outlines some strategic inflight mission management issues, then sketches an onboard mission manager that uses artificial intelligence techniques. Tasks handled by the mission manager include mission planner, global flight path generator, local flight path generator, crew interface, database manager, and navigation and guidance. I.E.

A88-34213

DISTRIBUTED EXPERT MANAGEMENT SYSTEM (DEMANS)

VINCE WALDRON, HAROLD W. SHARP (Systran Corp., Dayton, OH), and SCOTT A. STEFANOV (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: NAECON 87; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1987. Volume 4. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 1442-1447.

The distributed expert management system concept has been developed as a means of coordinating the operations of multiple pilot aiding expert systems. The concept currently includes an executive expert system called the Expert Manager and three subordinate systems. The Expert Manager reduces subordinate system autonomy when conflicts between systems arise, when higher level decision making is required, or when multiple system outputs must be combined for display to the pilot. I.E.

A88-35110

CAD/CAM MACHINE - INCLUDING PLANNING FOR CAD/CAE USAGE IN YOUR COMPANY OR MAJOR PROGRAM

GERALD P. KLEIN (Martin Marietta Corp., Denver, CO) IN: Aerospace century XXI: Space flight technologies; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 947-960. (AAS PAPER 86-281)

CAD/CAE/Computer-Aided Engineering (CAM) is a relatively new technology in the computer world. Early attempts at graphics representation were cumbersome and primitive, causing many engineering groups to remain in the manual mode of design. Today, there is a proliferation of new software and several technological advances that made the use of CAD/CAM/CAE not only attractive, but essential to the success of many larger companies. The early problems encountered in developing graphics computers, differences between graphics data files, and ADP files are discussed. The labyrinth of new technology is explored and the many areas of possible application of CAD/CAM/CAE are considered. Author

A88-38705#

RADARBET - A MULTIPLE TRAJECTORY ESTIMATOR USING AN EXPERT SYSTEM

L. A. SLEDJESKI and L. S. STONE (Grumman Data Systems Corp., Bethpage, NY) IN: AIAA Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 28-35.

(AIAA PAPER 88-2082)

'Radarbet', a nine-state Kalman filter-based trajectory estimator operating in real time for flight test applications, furnishes accurate trajectory data representing mission spatial positions, velocities, and accelerations for up to eight different aircraft simultaneously. These trajectory estimates can not only drive geographical displays, but will also provide real-time checkout of onboard navigation, radar, and weapons systems. Radarbet incorporates highly flexible mission reconfiguration capabilities. Operator interaction is kept to a minimum through the use of a high-level color graphics display and a rule-based expert system for real-time maintenance and filter stabilization. O.C.

A88-42306

REVIEW OF EXPERT SYSTEMS TECHNOLOGY

E. TURBAN (Southern California, University, Los Angeles) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, May 1988, p. 71-81. refs

An overview of expert systems technology is provided from a development point of view. The intent is to provide assistance in the practical aspects of constructing expert systems. Emphasis is placed on the benefits and limitations of expert systems, the various phases of the development processes, and the software tools used to expedite the development. Special attention is given to the interface with engineering management. I.E.

A88-42873

GNAT ROBOTS (AND HOW THEY WILL CHANGE ROBOTICS)

ANITA M. FLYNN (MIT, Cambridge, MA) IN: IEEE Micro Robots and Teleoperators Workshop: An investigation of micromechanical structures, actuators and sensors, Hyannis, MA, Nov. 9-11, 1987, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, 5 p. DARPA-supported research. refs (Contract N00014-86-K-0685; N00014-85-K-0124)

The use of micromechanical motors to achieve miniature (gnat-sized) mobile robots is considered. The potential applications of such robots are discussed, and the necessary technology, which already exists, is identified. Design strategies and details of a proposed implementation are given. Problems in the micromachining area are briefly examined. I.E.

A88-52226

AAAIC '87 - AEROSPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE; PROCEEDINGS OF THE THIRD ANNUAL CONFERENCE, DAYTON, OH, OCT. 5-9, 1987

JAMES R. JOHNSON, ED. Conference sponsored by Northrop Corp., Texas Instruments, Inc., and Lockheed Corp. Dayton, OH, AAAIC Conference Secretariat, 1988, 330 p. For individual items see A88-52227 to A88-52238.

Topics discussed include avionics expert systems development environments, neural networks, and optical computing. Consideration is also given to artificial intelligence in manufacturing, advanced problem-solving techniques, and the performance evaluation of knowledge-based systems. B.J.

A88-52329* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AUTOMATION AND ROBOTICS FOR THE SPACE STATION - THE INFLUENCE OF THE ADVANCED TECHNOLOGY ADVISORY COMMITTEE

ROBERT R. NUNAMAKER and KELLI F. WILLSHIRE (NASA, Langley Research Center, Hampton, VA) IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 3-76 to 3-79.

The reports of a committee established by Congress to identify specific systems of the Space Station which would advance automation and robotics technologies are reviewed. The history of the committee, its relation to NASA, and the reports which it has released are discussed. The committee's reports recommend the widespread use of automation and robotics for the Space Station, a program for technology development and transfer between industries and research and development communities, and the planned use of robots to service and repair satellites and their payloads which are accessible from the Space Station. R.B.

A88-52340* University of Central Florida, Orlando.

EXPERT SYSTEM PROTOTYPE DEVELOPMENTS FOR NASA-KSC BUSINESS AND ENGINEERING APPLICATIONS

JAMES M. RAGUSA and AVELINO J. GONZALEZ (Central Florida, University, Orlando, FL) IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 6-11 to 6-20. (Contract NAG10-0043)

Prototype expert systems developed for a variety of NASA

projects in the business/management and engineering domains are discussed. Business-related problems addressed include an assistant for simulating launch vehicle processing, a plan advisor for the acquisition of automated data processing equipment, and an expert system for the identification of customer requirements. Engineering problems treated include an expert system for detecting potential ignition sources in LOX and gaseous-oxygen transportation systems and an expert system for hazardous-gas detection. R.R.

A88-52350
CONCEPTUAL MODEL-BASED REASONING FOR KNOWLEDGE-BASED SOFTWARE PROJECT MANAGEMENT
 KENT D. BIMSON and LINDA BOEHM BURRIS (Lockheed Missiles and Space Co., Inc., Austin, TX) IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 9-1 to 9-11. refs

This paper presents a conceptual model for software project management and the power derived from using a conceptual model-based reasoning approach in building intelligent decision-support systems. The Software Project Manager (SPM) has been prototyped in Inference Corporation's Automated Reasoning Tool (ART) on Symbolics artificial intelligence (AI) workstations. An overview of the management model underlying SPM is presented, and the essential concepts and relationships needed to model the project management domain are defined. The knowledge representation strategy used to implement this conceptual model is then described. Finally, the power of using conceptual model-based reasoning in building intelligent decision-support systems for the project management domain is illustrated. Author

A88-53828#
ARTIFICIAL INTELLIGENCE FOR PROVIDING EXPERTISE ON INSTRUMENTATION
 MARK F. BRAMLETTE and PETER D. DEAN (Lockheed Aeronautical Systems Co., Valencia, CA) AIAA, NASA, and AFWAL, Conference on Sensors and Measurement Techniques for Aeronautical Applications, Atlanta, GA, Sept. 7-9, 1988. 8 p. (AIAA PAPER 88-4666)

The feasibility of developing an advisory or expert system (ES) applicable to instrument selection and for use in complex laboratory experiments is addressed. The results of the first phase of an application of a prototype ES in the selection of strain gages are reported. The various menus used in the selection of the strain gage are presented, and the operational capabilities of the ES are assessed based on the experimental results. Sample interactions with the ES are given. C.D.

N88-10687# Karlsruhe Univ. (Germany, F.R.). Falktaet fuer Informatik.
OBJECT-ORIENTED DATA BASE MANAGEMENT FOR ROBOT PROGRAMMING [OBJEKTORIENTIERTE DATENHALTUNG FUER DIE ROBOTERPROGRAMMIERUNG]
 PETER DADAM, RUEDIGER DILLMANN, ALFONS KEMPER, and PETER C. LOCKEMANN Nov. 1986 50 p In GERMAN; ENGLISH summary (ETN-87-90367) Avail: NTIS HC A03/MF A01

The data base system Relational Robotics Database system with extensible data types is presented. A comprehensive robot programming system is discussed and analyzed with respect to the data modeling requirements, emphasizing the modeling of robots. The proposed technical data base management system, that can be used as a central data repository for a robot programming system, is based on the non-normalized relational data model NFz. This model allows the definition of arbitrary deep nested structures, providing a simple modeling concept for hierarchical relationships among data objects. Based on this data model an object-oriented user interface provides the facility to define new application-specific data types. ESA

N88-14669# Joint Publications Research Service, Arlington, VA.
USSR REPORT: CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY
 9 Dec. 1986 86 p Transl. into ENGLISH from various Russian articles (JPRS-UCC-86-014) Avail: NTIS HC A05/MF A01

Translated articles from USSR technical journals and other periodicals are presented. Computer programs, computer applications, computer networks, and education are general areas of discussion.

N88-15004# LABEN Space Instrumentation and Systems, Milan (Italy).
EXPERT SYSTEM STUDY FOR SPACECRAFT MANAGEMENT Final Report
 P. DONZELLI, B. ANKERMOELLER, B. SOERENSEN, and R. KATZENBEISSER (Dornier-Werke G.m.b.H., Friedrichshafen, West Germany) Feb. 1987 110 p (Contract ESA-6029/84) (TL-2699-ISS-1; ESA-CR(P)-2445; ETN-88-91142) Avail: NTIS HC A06/MF A01

The feasibility with state of the art technology of an on-board expert system for management of an autonomous spacecraft was assessed. Requirements for the design, development and test of the expert system were specified. Fault management functions were selected and knowledge about them was detailed for power and on-board data handling. The definition of such domain knowledge was supported by a knowledge specification formalism proposed by the knowledge engineers to the domain experts for the preliminary acquisition of all the information considered useful and necessary for the creation of the knowledge base. The development environment, and approaches for the testing, evaluation and validation of the prototype fault management system were studied. The impact of the use of on-board expert systems on ground/spacecraft communication protocols and on board complexity was assessed. ESA

N88-16360*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THIRD CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS, PART 1
 JUDITH S. DENTON, comp., MICHAEL S. FREEMAN, comp., and MARY VEREEN, comp. Nov. 1987 421 p Conference held in Huntsville, Ala., 2-3 Nov. 1987; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville (NASA-CP-2492-Pt-1; M-575-PT-1; NAS 1.55:2492-Pt-1) Avail: NTIS HC A18/MF A01 CSCL 09B

The application of artificial intelligence to spacecraft and aerospace systems is discussed. Expert systems, robotics, space station automation, fault diagnostics, parallel processing, knowledge representation, scheduling, man-machine interfaces and neural nets are among the topics discussed.

N88-17239*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DESIGN KNOWLEDGE CAPTURE FOR THE SPACE STATION
 K. R. CROUSE and D. B. WECHSLER (Mitre Corp., Houston, Tex.) In its First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 239-245 Oct. 1987 Avail: NTIS HC A23/MF A01 CSCL 22B

The benefits of design knowledge availability are identifiable and pervasive. The implementation of design knowledge capture and storage using current technology increases the probability for success, while providing for a degree of access compatibility with future applications. The space station design definition should be expanded to include design knowledge. Design knowledge should be captured. A critical timing relationship exists between the space station development program, and the implementation of this project. Author

04 ROBOTICS AND EXPERT SYSTEMS

N88-17245*# Air Force Inst. of Tech., Wright-Patterson AFB, OH. Dept. of Operational Sciences.

ARTIFICIAL INTELLIGENCE (AI), OPERATIONS RESEARCH (OR), AND DECISION SUPPORT SYSTEMS (DSS): A CONCEPTUAL FRAMEWORK

GREGORY S. PARNELL, WILLIAM F. ROWELL, and JOHN R. VALUSEK /n NASA. Lyndon B. Johnson Space Center, Houston, Texas, First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 287-292 Oct. 1987

Avail: NTIS HC A23/MF A01 CSCL 09B

In recent years there has been increasing interest in applying the computer based problem solving techniques of Artificial Intelligence (AI), Operations Research (OR), and Decision Support Systems (DSS) to analyze extremely complex problems. A conceptual framework is developed for successfully integrating these three techniques. First, the fields of AI, OR, and DSS are defined and the relationships among the three fields are explored. Next, a comprehensive adaptive design methodology for AI and OR modeling within the context of a DSS is described. These observations are made: (1) the solution of extremely complex knowledge problems with ill-defined, changing requirements can benefit greatly from the use of the adaptive design process, (2) the field of DSS provides the focus on the decision making process essential for tailoring solutions to these complex problems, (3) the characteristics of AI, OR, and DSS tools appears to be converging rapidly, and (4) there is a growing need for an interdisciplinary AI/OR/DSS education. Author

N88-17337# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH.

MANAGEMENT OF COMPLEX INFORMATION IN SUPPORT OF EVOLVING AUTONOMOUS EXPERT SYSTEMS Final Report, Jan. 1983 - Mar. 1987

EUGENIO MARTINEZ Sep. 1987 75 p

(AD-A186680; AFWAL-TR-87-1123) Avail: NTIS HC A04/MF A01 CSCL 09B

Automata whose performance is dependent on specific information are referred to as expert systems. These effect and/or induce situations in the mission environment purposely and as supported by their respective subdomains should be able and capable of evolving concurrently with and relative to an ever evolving mission environment. Information perceived from the latter may be complex, i.e., with multivariate, interrelated and dynamic patterns. The following addresses the problem of complex information management in support of autonomous expert systems within evolving environments. Emphasis is placed on the systems ability to infer generalizations, appraise the circumstantial states of the mission environment, and perform appropriate decision making. GRA

N88-20049# Massachusetts Inst. of Tech., Lexington.
KNOWLEDGE-BASED SYSTEM ANALYSIS AND CONTROL Annual Report, 1 Oct. 1985 - 30 Sep. 1986

HAROLD M. HEGGESTAD 30 Sep. 1986 80 p

(Contract F19628-85-C-0002)

(AD-A188163; ESD-TR-87-041) AVAIL: NTIS HC A05/MF A01

The focus of Knowledge-Based Systems Analysis and Control was development of an Expert System to aid in the operation of the hundreds of military Technical Control Facilities having responsibility for the worldwide network of DoD dedicated circuits. An initial prototype of the Expert System was created, embodying a substantial proportion of the knowledge involved, and has resulted in improved understanding of Expert Systems techniques and pitfalls for such problems as well as a clear set of goals for completion of the work. GRA

N88-20054# Bolt, Beranek, and Newman, Inc., Cambridge, MA.
PHYSICS FOR ROBOTS

JAMES G. SCHMOLZE Sep. 1987 212 p

(Contract N00014-85-C-0079; N00014-77-C-0378)

(AD-A189056; BBN-6222) Avail: NTIS HC A10/MF A01 CSCL 23C

Robots that plan to perform everyday tasks need knowledge

of everyday physics. Physics For Robots (PFR) is representation of part of everyday physics directed towards this need. It includes general concepts and theories along with an application specific portion for tasks in cooking. PFR goes beyond the representation schemes of most AI planners by including natural processes that the robot can control. It also includes a theory of material composition so robots can identify and reason about physical objects that break apart, come together, mix, or go out of existence. This focus is made on the characterization of knowledge with: (1) PFR characterizes the robot's capabilities to act and perceive, and (2) PFR replaces the NP goal of developing models of actual common sense knowledge. The goal of PFR is to represent the knowledge about everyday physics that is needed to prove the effectiveness of certain robot Input/Output programs in accomplishing given tasks. It is expected that this knowledge will be needed by a robot that can plan to perform such everyday tasks. GRA

N88-20896*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, CA.

THE USE OF AN AUTOMATED FLIGHT TEST MANAGEMENT SYSTEM IN THE DEVELOPMENT OF A RAPID-PROTOTYPING FLIGHT RESEARCH FACILITY

EUGENE L. DUKE, MARLE D. HEWETT, RANDAL W. BRUMBAUGH, DAVID M. TARTT, ROBERT F. ANTONIEWICZ, and ARVIND K. AGARWAL May 1988 21 p Presented at the 4th Conference on Artificial Intelligence Applications, Long Beach, Calif., 4-6 May 1988

(NASA-TM-100435; H-1477; NAS 1.15:100435) Avail: NTIS HC A03/MF A01 CSCL 09B

An automated flight test management system (ATMS) and its use to develop a rapid-prototyping flight research facility for artificial intelligence (AI) based flight systems concepts are described. The ATMS provides a flight test engineer with a set of tools that assist in flight planning and simulation. This system will be capable of controlling an aircraft during the flight test by performing closed-loop guidance functions, range management, and maneuver-quality monitoring. The rapid-prototyping flight research facility is being developed at the Dryden Flight Research Facility of the NASA Ames Research Center (Ames-Dryden) to provide early flight assessment of emerging AI technology. The facility is being developed as one element of the aircraft automation program which focuses on the qualification and validation of embedded real-time AI-based systems. Author

N88-21643# Sandia National Labs., Albuquerque, NM.

HUMAN INTERFACES IN REMOTE DRIVING

D. E. MCGOVERN 1988 33 p Presented at the IGC Conference, Bedford, Mass., 20 Mar. 1988

(Contract DE-AC04-76DP-00789)

(DE88-006843; SAND-88-0562C; CONF-880359-1) Avail: NTIS HC A03/MF A01

Driving vehicles through remote control (teleoperation) can allow the human operator to take actions at a distance. Human effectiveness can be projected into locations which may be hazardous. In order for the operator to control the motion of these vehicles, knowledge of the vehicle environment and status need to be available. This requires a system consisting of vehicle, communication link and human operator. Much work has been done in vehicle and communication system design but comparatively little effort has been devoted to the human interface. In this paper, experimental studies of remote driving are reviewed to approach an understanding of what is known. Summary data are presented for experimental work performed at Sandia National Laboratories in vehicle vision systems. This information is combined with the experience base developed through several years of work with teleoperated vehicles to identify the major areas requiring additional development effort. DOE

N88-22313# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

COMPARATIVE ANALYSIS

DANIEL S. WELD Nov. 1987 49 p

(Contract N00014-85-K-0124)
(AD-A190556; AI-M-951) Avail: NTIS HC A03/MF A01 CSCL 121

Comparative analysis involves the problem of predicting how a system will react to perturbations in its parameters, and why. For example, comparative analysis could be asked to explain why the period of an oscillating spring/block system would increase if the mass of the block were larger. This paper formalizes the problem of comparative analysis and presents a technique, differential qualitative (DQ) analysis, which solves the task, providing explanation based generalization. DQ analysis uses inference rules to deduce qualitative information about the relative change of system parameters. Multiple perspectives are used to represent relative change values over intervals of time. Differential analysis has been implemented, tested on a dozen examples, and proven sound. Unfortunately, the technique is incomplete; it always terminates, but does not always return an answer. GRA

N88-23219*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

MICROGRAVITY ROBOTICS TECHNOLOGY PROGRAM

DOUGLAS A. ROHN, CHARLES LAWRENCE, and ANDREW S. BRUSH (Sverdrup Technology, Inc., Cleveland, Ohio.) 1988 14 p Proposed for presentation at the ISA/88 International Conference and Exhibit, Houston, Tex., 16-21 Oct. 1988; sponsored by the Instrument Society of America (NASA-TM-100898; E-4148; NAS 1.15:100898) Avail: NTIS HC A03/MF A01 CSCL 131

A research program to develop technology for robots operating in the microgravity environment of the space station laboratory is described. These robots must be capable of manipulating payloads without causing them to experience harmful levels of acceleration, and the motion of these robots must not disturb adjacent experiments and operations by transmitting reactions that translate into damaging effects throughout the laboratory. Solutions to these problems, based on both mechanism technology and control strategies, are discussed. Methods are presented for reduction of robot base reactions through the use of redundant degrees of freedom, and the development of a smoothly operating roller-driven robot joints for microgravity manipulators is discussed. Author

N88-23237*# Army Aviation Systems Command, Cleveland, OH. Structural Dynamics Branch.

MICROGRAVITY MECHANISMS AND ROBOTICS PROGRAM

DOUGLAS A. ROHN *In* NASA, Lewis Research Center, Lewis Structures Technology, 1988. Volume 1: Structural Dynamics p 143-155 May 1988
Avail: NTIS HC A20/MF A01 CSCL 131

The primary goal of this program is to produce the motion control tools necessary to enhance and enable a particular NASA mission - space laboratory-based microgravity experiments. To that end, a spectrum of technology is being developed in the disciplines of precision mechanisms and robotics. Author

N88-24188*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

THIRD CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS, PART 2

JUDITH S. DENTON, comp., MICHAEL S. FREEMAN, comp., and MARY VEREEN, comp. Jun. 1988 66 p Conference held in Huntsville, Ala., 2-3 Nov. 1987; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville Sponsored by NASA, Washington (NASA-CP-2492-PT-2; M-576-PT-2; NAS 1.55:2492-PT-2) Avail: NTIS HC A04/MF A01 CSCL 09B

Topics relative to the application of artificial intelligence to space operations are discussed. New technologies for space station automation, design data capture, computer vision, neural nets, automatic programming, and real time applications are discussed.

N88-25626# Joint Publications Research Service, Arlington, VA.
APPLICATION OF AI TO SPACE SYSTEMS

In its JPRS Report: Science and Technology. Japan p 55-58 4 May 1988 Transl. into ENGLISH from Kogiken Nyusu (Tokyo, Japan), Jan. 1988 p 8-10
Avail: NTIS HC A06/MF A01

The space station and other projects being developed through international cooperation with Japanese participation involve the construction of laboratories as a platform for various kinds of space experiments, such as experiments to create new materials using the space environment of weightlessness and vacuum, life science and observation experiments. The diverse, complex, and long term experiments done in space laboratory will be actually carried out by a small crew of passenger scientists. In carrying out space experiments it is necessary to make the crew's work in the space lab and the control and support from the ground more autonomous and intelligent, and to establish technology for running these experiments smoothly and efficiently. With this in mind, research has been conducted into space experiment support expert systems using artificial intelligence technology. Such systems can complement and take over part of the intellectual work of the crew. Author

N88-26851# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science/Dept. of Interactive Systems.

INTERACTION MANAGEMENT IN CAD SYSTEMS WITH A HISTORY MECHANISM

YASUSHI YAMAGUCHI, FUMIHIKO KIMURA (Tokyo Univ., Japan), and PAUL J. W. TENHAGEN Nov. 1987 15 p Submitted for publication Sponsored by the Japan Society of Precision Engineering and the Ricoh Co. Ltd. (CWI-CS-R8756; B8805679; ETN-88-92589) Avail: NTIS HC A03/MF A01

User friendliness in computer aided design systems is considered. A concept called model derivation, which describes how the user treats the model in terms of its evolution is introduced. To construct and use model derivation a history mechanism which keeps and manipulates the history of the modeling process is proposed. The history mechanism manages high level interactions by introducing powerful symbolic computation to manipulate the history. Since the history representation is based on the operation's syntax and separated from the internal model representation, it is easy to apply the history mechanism to any modeling system which uses established techniques. Thus the system designer can easily introduce model derivation without reducing efficiency of the implementation. ESA

N88-26866# Los Alamos National Lab., NM.

BUILDING AN ARTIFICIAL INTELLIGENCE CAPABILITY AT LOS ALAMOS

J. G. MARINUZZI 1988 5 p Presented at the Artificial Intelligence Applications for Military Logistics Conference, Williamsburg, Va., 29 Mar. 1988 (Contract W-7405-ENG-36) (DE88-009155; LA-UR-88-1166; CONF-880393-1) Avail: NTIS HC A02/MF A01

In 1985, after three years of preliminary work, Management of the Los Alamos National Laboratory started an ambitious program to develop a strong technical capability in the rapidly emerging field of Artificial Intelligence/Knowledge Based Systems (AI/KBS). When this AI development program began, except for a few staff members doing basic AI research, AI was essentially nonexistent at the laboratory. The basics, including such things as AI computer hardware and software, literature, books, knowledgeable personnel, or even a general knowledge of what AI was, were most difficult if not impossible to find. For this reason, we had to approach the problem with a very broad perspective, which strongly addressed the basics while aiming toward more advanced AI program elements. Broad, intensive education was the bootstrapping tool used in this five year, multi-million dollar AI capability development program. Halfway through the program, our accomplishments indicate that the program is extremely successful. In terms of trained staff, active programs and state-of-the-art equipment, we have developed one of the strongest AI technical

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capabilities within the Department of Energy (DOE) and the Department of Defense (DOD). However, a great deal more must be done before the full potential of the program can be realized.

DOE

N88-26867*# University of Central Florida, Orlando. Dept. of Computer Engineering.

EXPERT SYSTEM APPLICATION EDUCATION PROJECT Final Report, 10 Aug. 1987 - 10 Aug. 1988

AVELINO J. GONZALEZ and JAMES M. RAGUSA 8 Aug. 1988 5 p

(Contract NAG10-0043)

(NASA-CR-183089; NAS 1.26:183089) Avail: NTIS HC A02/MF A01 CSCL 09B

Artificial intelligence (AI) technology, and in particular expert systems, has shown potential applicability in many areas of operation at the Kennedy Space Center (KSC). In an era of limited resources, the early identification of good expert system applications, and their segregation from inappropriate ones can result in a more efficient use of available NASA resources. On the other hand, the education of students in a highly technical area such as AI requires an extensive hands-on effort. The nature of expert systems is such that proper sample applications for the educational process are difficult to find. A pilot project between NASA-KSC and the University of Central Florida which was designed to simultaneously address the needs of both institutions at a minimum cost. This project, referred to as Expert Systems Prototype Training Project (ESPTP), provided NASA with relatively inexpensive development of initial prototype versions of certain applications. University students likewise benefit by having expertise on a non-trivial problem accessible to them at no cost. Such expertise is indispensable in a hands-on training approach to developing expert systems.

Author

N88-29351*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

SECOND CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR SPACE APPLICATIONS

THOMAS DOLLMAN, comp. Aug. 1988 709 p Conference held in Huntsville, Ala., 13-14 Nov. 1986; sponsored by NASA, Marshall Space Flight Center, Huntsville, Ala. and Alabama Univ., Huntsville Sponsored by NASA, Washington, D.C.

(NASA-CP-3007; M-577; NAS 1.55:3007) Avail: NTIS HC A99/MF E03 CSCL 09B

The proceedings of the conference are presented. This second conference on Artificial Intelligence for Space Applications brings together a diversity of scientific and engineering work and is intended to provide an opportunity for those who employ AI methods in space applications to identify common goals and to discuss issues of general interest in the AI community.

N88-29352*# National Aeronautics and Space Administration, Washington, DC.

SPACE STATION AS A VITAL FOCUS FOR ADVANCING THE TECHNOLOGIES OF AUTOMATION AND ROBOTICS

GIULIO VARSI (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and DANIEL H. HERMAN *in* NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 1-6 Aug. 1988

(IAF-86-62) Avail: NTIS HC A99/MF E03 CSCL 22B

A major guideline for the design of the U.S. Space Station is that the Space Station address a wide variety of functions. These functions include the servicing of unmanned assets in space, the support of commercial labs in space and the efficient management of the Space Station itself; the largest space asset. The technologies of Automation and Robotics have the promise to help in reducing Space Station operating costs and to achieve a highly efficient use of the human in space. The use of advanced automation and artificial intelligence techniques, such as expert systems, in Space Station subsystems for activity planning and failure mode management will enable us to reduce dependency on a mission control center and could ultimately result in breaking the umbilical link from Earth to the Space Station. The application

of robotic technologies with advanced perception capability and hierarchical intelligent control to servicing system will enable the servicing of assets either in space or in situ with a high degree of human efficiency. The results of studies leading toward the formulation of an automation and robotics plan for Space Station development are presented.

Author

N88-29356*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

A SOFTWARE ENGINEERING APPROACH TO EXPERT SYSTEM DESIGN AND VERIFICATION

DANIEL C. BOCHSLER (LinCom Corp., Houston, Tex.) and MARY ANN GOODWIN *in* NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 47-60 Aug. 1988

Avail: NTIS HC A99/MF E03 CSCL 09B

Software engineering design and verification methods for developing expert systems are not yet well defined. Integration of expert system technology into software production environments will require effective software engineering methodologies to support the entire life cycle of expert systems. The software engineering methods used to design and verify an expert system, RENEX, is discussed. RENEX demonstrates autonomous rendezvous and proximity operations, including replanning trajectory events and subsystem fault detection, onboard a space vehicle during flight. The RENEX designers utilized a number of software engineering methodologies to deal with the complex problems inherent in this system. An overview is presented of the methods utilized. Details of the verification process receive special emphasis. The benefits and weaknesses of the methods for supporting the development life cycle of expert systems are evaluated, and recommendations are made based on the overall experiences with the methods.

Author

N88-29404*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

EXPERIMENT SCHEDULING FOR SPACELAB MISSIONS

JOHN JAAP and ELIZABETH DAVIS *in its* Second Conference on Artificial Intelligence for Space Applications p 475-488 Aug. 1988

Avail: NTIS HC A99/MF E03 CSCL 05A

The Experiment Scheduling Program (ESP) is the heart of a group of programs developed at NASA-Marshall to schedule the experiment activities of Spacelab and other Shuttle missions. Other programs in the group either prepare input data for ESP or produce derivative information based on the schedule produced by ESP. The task of experiment scheduling can be simply stated as positioning the experiment activities in a mission to that they collect their desired data without interfering with other activities. The program's capabilities as seen by the user are described along with mission constraints the program handles, and how the expert system in the program handles these constraints.

Author

N88-29408*# Alabama Univ., Huntsville.

PERSONNEL OCCUPIED WOVEN ENVELOPE ROBOT

FRANCIS WESSLING, WILLIAM TEOH, and M. CARL ZIEMKE *in* NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 513-521 Aug. 1988

Avail: NTIS HC A99/MF E03 CSCL 05H

The Personnel Occupied Woven Envelope Robot (POWER) provides an alternative to extravehicular activity (EVA) of space suited astronauts and/or use of long slender manipulator arms such as are used in the Shuttle Remote Manipulator System. POWER provides the capability for a shirt sleeved astronaut to perform such work by entering a control pod through air locks at both ends of an inflated flexible bellows (access tunnel). The exoskeleton of the tunnel is a series of six degrees of freedom (Six-DOF) articulated links compressible to 1/6 of their fully extended length. The operator can maneuver the control pod to almost any location within about 50 m of the base attachment to the space station. POWER can be envisioned as a series of hollow Six-DOF manipulator segments or arms wherein each arm grasps

the shoulder of the next arm. Inside the hollow arms is a bellow-type access tunnel. The control pod is the first of the series of linked hollow arms. The fingers of the fist are conventional manipulator arms under direct visual control of the nearby operator in the pod. The applications and progress to date of the POWER system is given. Author

N88-29409*# Boeing Aerospace Co., Huntsville, AL. Space Station Program.

REMOTE SERVICING OF SPACE SYSTEMS

S. L. COLLINS and R. B. PURVES /in NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 523-535 Aug. 1988
Avail: NTIS HC A99/MF E03 CSCL 05H

Space systems are difficult to maintain on orbit. The difficulty arises from the limited ability and availability of the astronaut work force in the hazardous space environment. Remote robotic manipulation can free the astronaut from the hazardous working environment while also increasing the work force. However, remote robotic servicing is not without its own set of problems and limitations, such as communication time delay and unstructured workites. Tests and test equipment are described which are designed to increase the understanding of the remote servicing problems and to allow development of potential solutions. A half scale satellite mockup was developed for evaluating and improving upon the design of replaceable subsystems, such as batteries and electronic boxes. A servicer system, that includes a six degree of freedom PUMA 560 robot and interchangeable end effectors (tools), was developed to aid in driving out servicer design requirements. The results include the time delay impact on servicing timelines and requirements for the servicer system. Author

N88-30330*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE 1988 GODDARD CONFERENCE ON SPACE APPLICATIONS OF ARTIFICIAL INTELLIGENCE

JAMES RASH, ed. and PETER HUGHES, ed. Aug. 1988 437 p Conference held in Greenbelt, Md., 24 May 1988 Sponsored by NASA, Washington, D.C.
(NASA-CP-3009; REPT-88B0212; NAS 1.55:3009) Avail: NTIS HC A19/MF A01 CSCL 09B

This publication comprises the papers presented at the 1988 Goddard Conference on Space Applications of Artificial Intelligence held at the NASA/Goddard Space Flight Center, Greenbelt, Maryland on May 24, 1988. The purpose of this annual conference is to provide a forum in which current research and development directed at space applications of artificial intelligence can be presented and discussed. The papers in these proceedings fall into the following areas: mission operations support, planning and scheduling; fault isolation/diagnosis; image processing and machine vision; data management; modeling and simulation; and development tools/methodologies.

N88-30332*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

ARTIFICIAL INTELLIGENCE COSTS, BENEFITS, RISKS FOR SELECTED SPACECRAFT GROUND SYSTEM AUTOMATION SCENARIOS

WALTER F. TRUSZKOWSKI, BARRY G. SILVERMAN, MARTHA KAHN, and HENRY HEXMOOR (Intellitek, Inc., Rockville, Md.) /in its The 1988 Goddard Conference on Space Applications of Artificial Intelligence p 17-31 Aug. 1988
Avail: NTIS HC A19/MF A01 CSCL 09B

In response to a number of high-level strategy studies in the early 1980s, expert systems and artificial intelligence (AI/ES) efforts for spacecraft ground systems have proliferated in the past several years primarily as individual small to medium scale applications. It is useful to stop and assess the impact of this technology in view of lessons learned to date, and hopefully, to determine if the overall strategies of some of the earlier studies both are being followed and still seem relevant. To achieve that end four idealized ground system automation scenarios and their attendant AI architecture are postulated and benefits, risks, and lessons learned

are examined and compared. These architectures encompass: (1) no AI (baseline), (2) standalone expert systems, (3) standardized, reusable knowledge base management systems (KBMS), and (4) a futuristic unattended automation scenario. The resulting artificial intelligence lessons learned, benefits, and risks for spacecraft ground system automation scenarios are described. Author

N89-30371# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

A STANDARD ARCHITECTURE FOR CONTROLLING ROBOTS

SUNDAR NARASIMHAN, DAVID M. SIEGEL, and JOHN M. HOLLERBACH Jul. 1988 25 p
(Contract N00014-86-K-0685; N00014-85-K-0124)
(AD-A195929; AI-M-977) Avail: NTIS HC A03/MF A01 CSCL 12F

This paper describes a fully implemented computational architecture that controls the Utah-MIT dextrous hand and other complex robots. Robots like the Utah-MIT hand are characterized by large numbers of actuators and sensors, and require high servo rates. Consequently, powerful and flexible computer architectures are needed to control them. The robotic architecture described in this paper derives its power from the highly efficient real-time environment provided for its control processors, coupled with a development host that enables flexible program development. By mapping the memory of a dedicated group of processors into the address space of a host computer, efficient sharing of system resources between them is possible. The software is characterized by a few simple design concepts but provides the facilities out of which more powerful utilities like a multi-processor pseudo-terminal emulator, a transparent and fast file server, and a flexible symbolic debugger could be constructed. GRA

N88-30372# Carnegie-Mellon Univ., Pittsburgh, PA. Robotics Inst.

KNOWLEDGE BASED SIMULATION: AN ARTIFICIAL INTELLIGENCE APPROACH TO SYSTEM MODELING AND AUTOMATING THE SIMULATION LIFE CYCLE Interim Technical Report

MARK S. FOX, NIZWER HUSAIN, MALCOLM MCROBERTS, and Y. V. REDDY 13 Apr. 1988 46 p Sponsored in part by Digital Equipment Corp. and Eestinghouse Electric Corp.
(AD-A195838; CMI-RI-TR-88-5) Avail: NTIS HC A03/MF A01 CSCL 12I

This paper summarizes the past eight years of research in the application of Artificial Intelligence (AI) to Simulation. Our focus has been in two areas: the use of AI knowledge representation techniques for the modeling of complex systems, and the codification of simulation expertise so that it can be used to manage the simulation life cycle. The Knowledge Based Simulation system is an embodiment of this research. It provides a complete simulation decision support environment for the modeling, validation, simulation and analysis of complex systems. KBS has been applied to a variety of problems including factory and distribution system analysis. By using a frame language to represent domain concepts, such as object structure, and goals, there is a one to one correspondence between the domain and the simulation model 2. Secondly, by using rules to represent object behavior, the specification and modification of the behaviors become easier. Lastly, explanation techniques developed around rule based systems provide the basis for explaining event behaviors. GRA

COMPUTERS AND INFORMATION MANAGEMENT

Includes Information Systems and Theory, Information Dissemination and Retrieval, Management Information Systems, Database Management Systems and Databases, Data Processing, Data Management, Communications and Communication Theory, Documentation and Information Presentation, Software, Software Acquisition, Software Engineering and Management, Computer Systems Design and Performance, Configuration Management (Computers), Networking, Office Automation, Information Security.

A88-10175

INTERNATIONAL CONFERENCE ON JAPANESE INFORMATION IN SCIENCE, TECHNOLOGY AND COMMERCE, UNIVERSITY OF WARWICK, COVENTRY, ENGLAND, SEPT. 1-4, 1987, PREPRINTS

Conference sponsored by the British Library Japanese Information Service, University of Warwick, NTIS, et al. London, British Library Japanese Information Service, 1987, 350 p. No individual items are abstracted in this volume.

The current status of technical and scientific information services in Japan is discussed in reviews and reports, with an emphasis on the availability of Japanese information to the U.S. and Europe. Topics addressed include Japanese attitudes toward information and barriers faced by Westerners in acquiring Japanese information, the use of technical literature for competitive assessments, Japanese scientific and technological information on the U.S., and recent U.S. efforts to monitor Japanese technology. Consideration is given to techniques for minimizing obstacles to using Kanji data, the services provided by specific technical information organizations, the English-language physics literature from Japan, and approaches to data-base production in Japan.

T.K.

A88-10965* National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

TRADITIONAL VERSUS RULE-BASED PROGRAMMING TECHNIQUES - APPLICATION TO THE CONTROL OF OPTIONAL FLIGHT INFORMATION

WENDELL R. RICKS and KATHY H. ABBOTT (NASA, Langley Research Center, Hampton, VA) SPIE, Technical Symposium Southeast on Optics, Electro-optics, and Sensors, Orlando, FL, May 17-22, 1987, Paper. 8 p. refs

A traditional programming technique for controlling the display of optional flight information in a civil transport cockpit is compared to a rule-based technique for the same function. This application required complex decision logic and a frequently modified rule base. The techniques are evaluated for execution efficiency and implementation ease; the criterion used to calculate the execution efficiency is the total number of steps required to isolate hypotheses that were true and the criteria used to evaluate the implementability are ease of modification and verification and explanation capability. It is observed that the traditional program is more efficient than the rule-based program; however, the rule-based programming technique is more applicable for improving programmer productivity.

I.F.

A88-12577#

ADA - WHAT EVERY GOOD MANAGER NEEDS TO KNOW

JUDY BAMBERBERGER (TRW, Inc., TRW Defense Systems Group, Redondo Beach, CA) IN: AIAA Computers in Aerospace Conference, 6th, Wakefield, MA, Oct. 7-9, 1987, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 368-374. refs (AIAA PAPER 87-2857)

The success of software development programs employing ADA is noted to primarily depend on project management practices. Attention is given to the experiences that have prompted this view among design and implementation teams, DoD program

offices, and contractor project managers. The use of ADA as an implementation language notably affects configuration management, since ADA precisely defines the way in which the separate modules of a program depend upon one another. ADA also has a distinct impact on the integration-and-test phase of software development, with intermodule consistency being automatically verified by the ADA compilers. O.C.

A88-13101

THE NEXT COMPUTER REVOLUTION

ABRAHAM PELED (IBM Thomas J. Watson Research Center, Yorktown Heights, NY) Scientific American (ISSN 0036-8733), vol. 257, Oct. 1987, p. 57-64.

Developments expected in computing during the next decade are discussed. Improvements that will occur in miniaturization, software development, and reductions in the cost of computing are examined, and the impact of these improvements on the production and distribution of information are considered. The impact of optoelectronic circuits on computer hardware and new high-level languages on software is addressed. The expanding applications of AI and of personal computers are discussed.

C.D.

A88-13106

INTERFACES FOR ADVANCED COMPUTING

JAMES D. FOLEY (George Washington University, Washington, DC) Scientific American (ISSN 0036-8733), vol. 257, Oct. 1987, p. 127-130, 132, 134, 135.

Supercomputer-created 'artificial realities' that facilitate user-computer communication are discussed. Improved display monitors and head-mounted displays and their accessories are addressed. The DataGlove, which translates hand and finger movements into electrical signals, and may provide major advances in user-computer interaction, is described. Other tactile-feedback technologies are examined, and voice- and gesture-recognition systems are discussed.

C.D.

A88-13107

NETWORKS FOR ADVANCED COMPUTING

ROBERT E. KAHN Scientific American (ISSN 0036-8733), vol. 257, Oct. 1987, p. 136-143.

The history and present status of computer networking are reviewed, and continuing developments in this area are discussed. Aspects of communication network design are examined, including packet-switching and local area networks, and communication between heterogeneous computer systems is addressed. Internet architecture as a solution to the problems of network computing is described, and potential areas for future networking are considered.

C.D.

A88-13111

ENGINEER'S GUIDE TO COMPOSITE MATERIALS

JOHN W. WEETON, DEAN M. PETERS, and KARYN L. THOMAS Metals Park, OH, American Society for Metals, 1987, 390 p. refs

The mechanical properties of composites, the fundamental principles of structural design using composites, and examples of typical applications are presented in a comprehensive handbook. Chapters are devoted to the basic characteristics of composites; the economic outlook for composites and reinforcing materials; the design equations; case histories of design and recreational, automotive, aerospace, marine, medical, electrical, and structural applications; and property data on reinforcements, polymer matrices, metal-matrix composites, and ceramic-matrix and glass-matrix composites. Extensive diagrams and tables, directories of laboratories and manufacturers, lists of trade associations and societies, and a glossary of terms are provided. T.K.

A88-13623* Hunter Coll., New York.

RECENT TRENDS IN GEOGRAPHIC INFORMATION SYSTEM RESEARCH

K. C. CLARKE (Hunter College, New York) Geo-Processing (ISSN

0165-2273), vol. 3, May 1986, p. 1-15. refs
(Contract NCA2-OR-305-201)

This paper reviews recent contributions to the body of published research on Geographic Information Systems (GISs). Increased usages of GISs have placed a new demand upon the academic and research community and despite some lack of formalized definitions, categorizations, terminologies, and standard data structures, the community has risen to the challenge. Examinations of published GIS research, in particular on GIS data structures, reveal a healthy, active research community which is using a truly interdisciplinary approach. Future work will undoubtedly lead to a clearer understanding of the problems of handling spatial data, while producing a new generation of highly sophisticated GISs.

Author

A88-14584

A COMPREHENSIVE MODEL FOR THE DESIGN OF DISTRIBUTED COMPUTER SYSTEMS

HEMANT K. JAIN (Wisconsin, University, Milwaukee) IEEE Transactions on Software Engineering (ISSN 0098-5589), vol. SE-13, Oct. 1987, p. 1092-1104. refs

To address the problem of designing a distributed computer system, a model is proposed for selecting a proper class of processor for each location and allocating data files/databases. The initial design takes into account the type and volume of transactions, in addition to the number of files expected in the system. The problem is formulated as a nonlinear goal programming problem, and an appropriate solution is obtained using a heuristic which is based on a modified pattern search approach. R.R.

A88-15282* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

SPACE STATION GROUND DATA MANAGEMENT SYSTEM

JAN HEUSER and WILLIAM SLOAN (NASA, Kennedy Space Center, Cocoa Beach, FL) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 8 p.

KSC is planning a Space Station Ground Data Management System (GDMS) for support of functional interface verification, integration and test of Space Station modules and elements. This computer system, planned for initial operational support in 1992, currently is entering a definition and prototyping stage. This paper provides an overview of the GDMS system concept. It synthesizes system functional capabilities, and discusses software and hardware architectural approaches currently under evaluation. It identifies programmatic constraints and their influence upon the concept, as well as specific technical issues planned for study or evaluation via prototyping. Author

A88-15851*# National Aeronautics and Space Administration, Washington, DC.

SPACE STATION INFORMATION SYSTEM - CONCEPTS AND INTERNATIONAL ISSUES

R. B. WILLIAMS, DAVID PRUETT, and DANA L. HALL (NASA, Space Station Program Office, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs
(IAF PAPER 87-76)

The Space Station Information System (SSIS) is outlined in terms of its functions and probable physical facilities. The SSIS includes flight element systems as well as existing and planned institutional systems such as the NASA Communications System, the Tracking and Data Relay Satellite System, and the data and communications networks of the international partners. The SSIS strives to provide both a 'user friendly' environment and a software environment which will allow for software transportability and interoperability across the SSIS. International considerations are discussed as well as project management, software commonality, data communications standards, data security, documentation commonality, transaction management, data flow cross support, and key technologies. K.K.

A88-15863*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SCIENCE ON THE SPACE STATION: THE OPPORTUNITY AND THE CHALLENGE - A NASA VIEW

MICHAEL DEVIRIAN, JAMES R. WEISS (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; NASA, Office of Space Science and Applications, Washington, DC), and ERWIN SCHMERLING (NASA, Office of Space Science and Applications, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p.
(IAF PAPER 87-92)

The Science and Applications Information System (SAIS) which will provide users with remote, interactive, and iterative access from their home locations to the many information system services is introduced. Such aspects as transaction management, standard format data units, and the use of intelligent data management systems are discussed. It is concluded that new and innovative approaches to information management must be developed so that the full potential of the Space Station can be realized with respect to the demands of the entire science community. K.K.

A88-15906*# National Aeronautics and Space Administration, Washington, DC.

A PROPOSED APPLICATIONS INFORMATION SYSTEM - CONCEPT, IMPLEMENTATION, AND GROWTH

DUDLEY G. MCCONNELL (NASA, Office of Space Science and Applications, Washington, DC), CARROLL A. HOOD, and M. KRISTINE BUTERA (Science Applications International Corp., Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs
(IAF PAPER 87-156)

This paper describes a newly developed concept within NASA for an Applications Information System (AIS). The AIS would provide the opportunity to the public and private sectors of shared participation in a remote sensing research program directed to a particular set of land-use or environmental problems. Towards this end, the AIS would offer the technological framework and information system resources to overcome many of the deficiencies that end-users have faced over the years such as limited access to data, delay in data delivery, and a limited access to data reduction algorithms and models to convert data to geophysical measurements. In addition, the AIS will take advantage of NASA developments in networking among information systems and use of state of the art technology, such as CD Roms and optical disks for the purpose of increasing the scientific benefits of applied environmental research. The rationale for the establishment of an AIS, a methodology for a step-wise, modular implementation, and the relationship of the AIS to other NASA information systems are discussed. Author

A88-16144#

ASTRONAUTICS IN THE BASIC ABSTRACT JOURNALS OF THE WORLD

N. L. KRASHENINNIKOVA and N. N. MAMA! (Vsesoiuznyi Institut Nauchnoi i Tekhnicheskoi Informatsii, Moscow, USSR) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p.
(IAF PAPER 87-512)

Results are presented from a statistical analysis of the coverage of astronautics topics (as defined by the IAF) in IAA, STAR, Astronomy and Astrophysics Abstracts, and 12 other Western abstract journals. For each abstract journal, a table is provided listing the astronautics subject categories covered, the number of abstracts published per year in each category, and the IAF Congress session corresponding approximately to the category. The Western coverage is then compared with that of the Soviet abstract journal VINITI, as analyzed by Krasheninnikova (1981 and 1982); it is found that VINITI abstracts more papers than any other journal in some IAF fields, but that STAR and IAA contain more abstracts than VINITI on space propulsion (IAA), space biology and medicine (IAA), and space transportation systems (STAR). It is also pointed out that IAA and STAR cover many

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scientific and technological fields not included in the IAF definition of astronautics. T.K.

A88-16167#

NASA-STD-3000, MAN-SYSTEM INTEGRATION STANDARDS - THE NEW SPACE HUMAN ENGINEERING STANDARDS

KEITH H. MILLER and CHARLES W. GEER (Boeing Aerospace Co., Seattle, WA) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. (IAF PAPER 87-550)

Various aspects of the process used to develop NASA-STD-3000, Man-System Integration Standards (MSIS) are reviewed, as are the documents, the database, and a videotape that are currently available from NASA. The MSIS provides the specific information needed to ensure proper integration of the man-system interface requirements with those of other aerospace disciplines. In addition to the requirements, the MSIS provides design considerations and examples which help the user understand the rationale behind the requirements. The implementation and maintenance of MSIS are also discussed.

V.L.

A88-18290

MOSAICS - A SYSTEM TO PRODUCE STATE-OF-THE-ART SATELLITE IMAGERY FOR RESOURCE MANAGERS

J. P. FRIEDEL (MacDonald, Dettwiler and Associates, Richmond, Canada) and T. A. FISHER (Canada Centre for Remote Sensing, Ottawa) Geocarto International (ISSN 1010-6049), vol. 2, Sept. 1987, p. 5-12.

This paper describes the Multi-Observation Satellite Image Correction System (MOSAICS), a precision correction facility for processing data from the Landsat MSS and TM sensors and from the SPOT Multi-Spectral Linear Array and Panchromatic Linear Array sensors at the Canada Centre for Remote Sensing. MOSAICS produces a wide range of product types, from completely raw to fully corrected with subpixel accuracy. Products are offered as full scenes in the spacecraft projection and as geocoded subscenes rotated to the UTM map projection. All products are offered as both Computer Compatible Tapes (CCTs) and films. CCTs are produced in the standard Landsat Ground Station Operator's Working Group format with the full range of options allowed by this family of formats. Film products are exposed directly on a color film recorder with a wide choice of radiometric enhancements including scene histogram enhancements, reflectance based enhancements and custom (user specified) enhancements.

Author

A88-19666#

ROLE OF DATA BASE MANAGEMENT IN DESIGN OPTIMIZATION SYSTEMS

G. J. PARK and J. S. ARORA (Iowa, University, Iowa City) (Structures, Structural Dynamics and Materials Conference, 27th, San Antonio, TX, May 19-21, 1986, Technical Papers, Part 1, p. 620-629) Journal of Aircraft (ISSN 0021-8669), vol. 24, Nov. 1987, p. 745-750. Previously cited in issue 18, p. 2675, Accession no. A86-38866. refs

(Contract AF-AFOSR-82-0322)

A88-20252* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DATA ACCESS FOR SCIENTIFIC PROBLEM SOLVING

JAMES W. BROWN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Problem solving environments for scientific computing. Amsterdam, North-Holland, 1987, p. 33-46. refs

An essential ingredient in scientific work is data. In disciplines such as Oceanography, data sources are many and volumes are formidable. The full value of large stores of data cannot be realized unless careful thought is given to data access. JPL has developed the Pilot Ocean Data System to investigate techniques for archiving and accessing ocean data obtained from space. These include efficient storage and rapid retrieval of satellite data, an easy-to-use

user interface, and a variety of output products which, taken together, permit researchers to extract and use data rapidly and conveniently. Author

A88-20486* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AUTOPLAN - A PC-BASED AUTOMATED MISSION PLANNING TOOL

FRANK C. PATERRA, MARC S. ALLEN (Computer Technology Associates, Inc., Newport News, VA), and GEORGE F. LAWRENCE (NASA, Langley Research Center, Hampton, VA) Telematics and Informatics (ISSN 0736-5853), vol. 4, no. 4, 1987, p. 263-273.

(Contract NAS1-18247)

A PC-based automated mission and resource planning tool, AUTOPLAN, is described, with application to small-scale planning and scheduling systems in the Space Station program. The input is a proposed mission profile, including mission duration, number of allowable slip periods, and requirement profiles for one or more resources as a function of time. A corresponding availability profile is also entered for each resource over the whole time interval under study. AUTOPLAN determines all integrated schedules which do not require more than the available resources. R.R.

A88-21205* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A VIBROACOUSTIC DATABASE MANAGEMENT CENTER FOR SHUTTLE AND EXPENDABLE LAUNCH VEHICLE PAYLOADS

VALERIE C. THOMAS (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) (Institute of Environmental Sciences and Aerospace Corp., Aerospace Testing Seminar, 10th, Los Angeles, CA, Mar. 1987) Journal of Environmental Sciences (ISSN 0022-0906), vol. 30, Nov.-Dec. 1987, p. 24-26. USAF-sponsored research. refs

A Vibroacoustic Database Management Center has recently been established at the Jet Propulsion Laboratory (JPL). The center uses the Vibroacoustic Payload Environment Prediction System (VAPEPS) computer program to maintain a database of flight and ground-test data and structural parameters for both Shuttle and expendable launch-vehicle payloads. Given the launch-vehicle environment, the VAPEPS prediction software, which employs Statistical Energy Analysis (SEA) methods, can be used with or without the database to establish the vibroacoustic environment for new payload components. This paper summarizes the VAPEPS program and describes the functions of the Database Management Center at JPL. Author

A88-21642* Mitre Corp., Houston, TX.

AN APPROACH TO DESIGN KNOWLEDGE CAPTURE FOR THE SPACE STATION

D. B. WECHSLER (Mitre Corp., Houston, TX) and K. R. CROUSE (NASA, Johnson Space Center, Houston, TX) IN: Space Station automation II; Proceedings of the Meeting, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 106-113. Previously announced in STAR as N87-12597. refs

The design of NASA's space station has begun. During the design cycle, and after activation of the space station, the reoccurring need will exist to access not only designs, but also deeper knowledge about the designs, which is only hinted in the design definition. Areas benefiting from this knowledge include training, fault management, and onboard automation. NASA's Artificial Intelligence Office at Johnson Space Center and The MITRE Corporation have conceptualized an approach for capture and storage of design knowledge. Author

A88-22082#

NETWORK MANAGEMENT FOR THE SPACE STATION INFORMATION SYSTEM

JOHN V. PIETRAS and MICHAEL A. ALLEN (Mitre Corp., Greenbelt, MD) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 8 p. refs (AIAA PAPER 88-0118)

NASA's Space Station Information System (SSIS) communications networks will furnish computer-to-computer data, audio, and video traffic services, as well as traditional spacecraft command and telemetry data flows. The SSIS will accomplish this by means of a combination of NASA institutional, public, and international networks, using several protocol suites. The 'network management' task of integrating, controlling, and monitoring this concentration of networks is presently discussed with a view to the formulation of a candidate network management architecture.

O.C.

A88-22410*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MISSION OPERATIONS SYSTEMS FOR PLANETARY EXPLORATION

WILLIAM I. MCLAUGHLIN and DONNA M. WOLFF (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 12 p. refs (AIAA PAPER 88-0547)

The purpose of the paper is twofold: (1) to present an overview of the processes comprising planetary mission operations as conducted at the Jet Propulsion Laboratory, and (2) to present a project-specific and historical context within which this evolving process functions. In order to accomplish these objectives, the generic uplink and downlink functions are described along with their specialization to current flight projects. Also, new multi-mission capabilities are outlined, including prototyping of advanced-capability software for subsequent incorporation into more automated future operations. Finally, a specific historical ground is provided by listing some major operations software plus a genealogy of planetary missions beginning with Mariner 2 in 1962.

Author

A88-22566#

EDUCATIONAL USES OF THE AEROSPACE DATABASE

BARBARA LAWRENCE (AIAA, New York) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 12 p. refs (AIAA PAPER 88-0749)

The underutilization of the aerospace literature and its importance in maintaining the competitiveness of the aerospace engineer and the industry is discussed. Use of the computerized Aerospace Database to support the engineering educator, the educational process, and the student is described. This paper discusses use of the Aerospace Database, a comprehensive information resource, to brain students in literature value and computerized information retrieval. The AIAA/TIS program to help educators incorporate these concepts into their courses and various computerized aids for database searching are described.

Author

A88-23253

GEOGRAPHIC INFORMATION SYSTEMS FOR RESOURCE MANAGEMENT: A COMPENDIUM

WILLIAM J. RIPPLE, ED. (Oregon State University, Corvallis) Falls Church, VA, American Society for Photogrammetry and Remote Sensing and American Congress on Surveying and Mapping, 1987, 293 p. No individual items are abstracted in this volume.

An introduction is given to the techniques and functional capabilities of geographic information systems. Recent information on the use of geographic information systems for a variety of resource management applications is compiled. An overview is provided on the nature of geographic information systems. A detailed description of the techniques required to create a computerized spatial database is presented. The capabilities of computer-based geographic information systems are reviewed on a function-by-function basis. The applications of geographic information systems in the management of water, soil, and vegetation resources and in land suitability studies, urban studies, and global studies are considered.

C.D.

A88-23260

THE TEACHING OF AIRCRAFT DESIGN COMPUTER APPLICATIONS

J. P. FIELDING (Cranfield Institute of Technology, England) IN: Computer applications in aircraft design and operation; Proceedings of the First International Conference on Computer Aided Design, Manufacture and Operation in the Aeronautics and Space Industries, Paris, France, June 16-18, 1987. Billerica, MA, Computational Mechanics Publications, 1987, p. 1-13.

Current work in aircraft conceptual design analysis, aircraft visualization, and detail design being done at the College of Aeronautics at Cranfield Institute of Technology is described. A multinational project to develop an expert system for civil aircraft design is described, and analytical methods being used in design are briefly considered. Design visualization and detail design work at Cranfield are summarized, and the use of computers in a group design project is discussed.

C.D.

A88-23981#

EVOLUTION OF DATA MANAGEMENT SYSTEMS FROM SPACELAB TO COLUMBUS

GUENTHER BRANDT and HANS-J. POSPIESZCZYK (MBB-ERNO Raumfahrttechnik GmbH, Bremen, Federal Republic of Germany) AIAA and NASA, Symposium on Space Information Systems in the Space Station Era, Washington, DC, June 22-24, 1987, Paper. 8 p. (MBB-UR-E-968-87)

The evolution of data processing concepts is reviewed with reference to the experience gained from the development of Spacelab and its utilization, the ongoing development of the Eureka system, and the present design and specification phase of Columbus. It is noted that the development of special architectures, interfaces, and protocols should be avoided and performed only if existing commercially available solutions cannot be used. The architecture design should provide for efficient accommodation of technology progress. The need for powerful simulations not only for early testing but also for in-depth and efficient assessment and monitoring of the data processing system performance is emphasized.

V.L.

A88-24961

A DISTRIBUTED RESOURCE MANAGEMENT MECHANISM FOR A PARTITIONABLE MULTIPROCESSOR SYSTEM

WOEI LIN (Pennsylvania State University, University Park) and CHUAN-LIN WU (Texas, University, Austin) IEEE Transactions on Computers (ISSN 0018-9340), vol. 37, Feb. 1988, p. 201-210. Research supported by the University of Texas and IBM. refs

This paper presents a resource management mechanism for a multiprocessor system, which contains a pool of homogeneous processing elements interconnected by multistage networks. The mechanism aims at making effective use of hardware resources of the multiprocessor system in support of high-performance parallel computations. The mechanism can create many physically independent subsystems simultaneously without incurring internal fragmentation. Each subsystem can then configure itself to form a desired topology for matching the structure of the parallel computation. The proposed mechanism is distributed in nature. It is divided into three functionally disjoint procedures which may reside in different loci for handling various resource management tasks concurrently. Furthermore, the simulation results show that with the elimination of internal fragmentation, the proposed mechanism achieves better resource utilization in comparison to a reference machine.

Author

A88-27490

THE NEXT WAVE OF JAPANESE SUPERCOMPUTERS

RICHARD A. JENKINS Computers in Physics (ISSN 0894-1866), vol. 2, Mar.-Apr. 1988, p. 34-39.

Although the Super-Speed Project (SSP) funded by Japan's Ministry of International Trade and Industry does not intend to directly produce a commercial supercomputer, Japanese firms have proven capable of building and marketing state-of-the-art supercomputers. Ironically, the most advanced Japanese work in supercomputer design appears to be taking place in corporate research labs rather than as part of the SSP. In 1988, the separate paths of research in IC development, parallel architectures, and

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parallelizing compiler software will begin to converge into a 'scientific demonstration system' rather than a commercial project. Comparisons are made with the status of DARPA's Strategic Computing Initiative. O.C.

A88-27780#

SAMPLING CRITERIA IN MULTICOLLECTION SEARCHING

A. GILIO, R. SCOZZAFAVA (Roma I, Universita, Rome, Italy), and P. G. MARCHETTI (ESA, Information Retrieval Service, Frascati, Italy) ESA Journal (ISSN 0379-2285), vol. 11, no. 3, 1987, p. 343-352. refs

In the first stage of the document retrieval process, no information concerning relevance of a particular document is available. On the other hand, computer implementation requires that the analysis be made only for a sample of retrieved documents. This paper addresses the significance and suitability of two different sampling criteria for a multicollection online search facility. The inevitability of resorting to a logarithmic criterion in order to achieve a 'spread of representativeness' from the multicollection is demonstrated. Author

A88-29771#

THE EUROPEAN SPACE PHYSICS ANALYSIS NETWORK

T. R. SANDERSON (ESA, Space Science Dept., Noordwijk, Netherlands), M. ALBRECHT (ESA, European Space Research Institute, Frascati, Italy), W. BAUMJOHANN (Max-Planck-Institut fuer extraterrestrische Physik, Garching, Federal Republic of Germany), P. BENVENUTI (European Southern Observatory, Garching, Federal Republic of Germany), J. FRANKS (ESA, European Space Operations Centre, Darmstadt, Federal Republic of Germany) et al. ESA Bulletin (ISSN 0376-4265), no. 53, Feb. 1988, p. 45-47.

A Space Physics Analysis Network (SPAN) information link was established in 1985 between NASA and ESA; it currently encompasses about 1000 VAX computers on both sides of the Atlantic, as well as the additional 1000 nodes of the High Energy Physics Network in the USA (but not in Europe). The backbone of the European element of SPAN is ESANET. In Europe, the Space Telescope Data Base has also been connected to SPAN. O.C.

A88-29773#

PRINCIPLES FOR INFORMATION SYSTEMS DESIGN FOR SPACE PROJECTS

R. J. STEVENS, G. ALVISI (ESA, Documentation Service, Frascati, Italy), R. T. GREENWOOD (ESA, Manned and Retrievable Systems Dept., Noordwijk, Netherlands), and M. DESCHAMPS (CNES, Toulouse, France) ESA Bulletin (ISSN 0376-4265), no. 53, Feb. 1988, p. 69-75.

The critical factors for successful implementation of an information system for the space industry encompass thorough analyses of user needs and constraints upon solutions, with an emphasis on the use of off-the-shelf products' rather specialized development. It is also useful to use a commercial and international exchange of information with contractors, and to realize that hardware acquisition policies are often driven by software requirements. The system architecture should be sufficiently flexible to cope with technological changes and changes in users' requirements. O.C.

A88-30999*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

LARGE SPACE STRUCTURES - STRUCTURAL CONCEPTS AND MATERIALS

CHARLES P. BLANKENSHIP and ROBERT J. HAYDUK (NASA, Langley Research Center, Hampton, VA) SAE, International Pacific Air and Space Technology Conference, Melbourne, Australia, Nov. 13-17, 1987. 30 p. refs (SAE PAPER 872429)

Large space structures will be a key element of the future space activities. They will include spacecraft such as the planned Space Station and large antenna/reflector structures for communications and observations. These large structures will

exceed 100 m in length or 30 m in diameter. Concepts for construction of these spacecraft on orbit and their materials of construction provide some unique research challenges. This paper will provide an overview of the research in space construction of large structures including erectable and deployable concepts. Also, an approach to automated, on-orbit construction will be presented. Materials research for space applications focuses on high stiffness, low expansion composite materials that provide adequate durability in the space environment. The status of these materials research activities will be discussed. Author

A88-31276

1987 INTERNATIONAL CONFERENCE ON CHINESE AND ORIENTAL LANGUAGE COMPUTING, ILLINOIS INSTITUTE OF TECHNOLOGY, CHICAGO, IL, JUNE 15-17, 1987, PROCEEDINGS

Conference organized by the Chinese Language Computer Society and National University of Singapore; Supported by Wang Laboratories, Inc., Intech Systems, International Geosystems Corp., et al. Singapore, Chinese Language Computer Society, 1987, 285 p. For individual items see A88-31277 to A88-31292.

Various papers on Chinese and Oriental language computing are presented. Some of the individual topics considered include: design of a dynamically reconfigurable keyboard, recognition of lexical tones for isolated syllables and disyllables in Mandarin speech, fast Chinese characters accessing technique using Mandarin phonetic transcriptions, a knowledge-acquisitive system on Chinese texts in decision support systems, an expert system-developing environment with Chinese texts and images in parallel, a generic Chinese input system, and sequence prediction for Chinese language input. Also addressed are: computer processing of Japanese ideographs, a Chinese reading system, the Chinese computer input language PINXXIEE, the phonetic Chinese language computer system, a new input system for Chinese language processing, modular dictionary design for Chinese-to-English machine translation, a new design technique for a Chinese and English database management system, and a powerful language-processing system for English-Chinese machine translation. C.D.

A88-33629*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TELEMETRY HANDLING ON THE SPACE STATION DATA MANAGEMENT SYSTEM

VIRGINIA A. WHITELAW (NASA, Johnson Space Center, Houston, TX) IN: ITC/USA/'87; Proceedings of the International Telemetering Conference, San Diego, CA, Oct. 26-29, 1987. Research Triangle Park, NC, Instrument Society of America, 1987, p. 17-26.

This paper examines the impact of telemetry handling on the design of the onboard networks that are part of the Space Station Data Management System (DMS). An architectural approach to satisfying the DMS requirement for support of the high throughput needed for telemetry transport and for servicing distributed computer systems is discussed. Several of the functionality vs. performance tradeoffs that must be made in developing an optimized mechanism for handling telemetry data in the DMS are considered. C.D.

A88-33665* Bendix Field Engineering Corp., Columbia, MD. **DISTRIBUTED OPERATING SYSTEM FOR NASA GROUND STATIONS**

JOHN F. DOYLE (Bendix Field Engineering Corp., Columbia, MD) IN: ITC/USA/'87; Proceedings of the International Telemetering Conference, San Diego, CA, Oct. 26-29, 1987. Research Triangle Park, NC, Instrument Society of America, 1987, p. 423-431. (Contract NAS5-27600)

NASA ground stations are characterized by ever changing support requirements, so application software is developed and modified on a continuing basis. A distributed operating system was designed to optimize the generation and maintenance of those applications. Unusual features include automatic program

generation from detailed design graphs, on-line software modification in the testing phase, and the incorporation of a relational database within a real-time, distributed system. Author

A88-33671*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

AN OVERVIEW OF THE HUBBLE SPACE TELESCOPE COMMAND AND DATA MANAGEMENT SYSTEM

JERRY CLUBB (NASA, Marshall Space Flight Center, Huntsville, AL) and FRANK INGELS (Mississippi State University, Mississippi State) IN: ITC/USA/'87; Proceedings of the International Telemetry Conference, San Diego, CA, Oct. 26-29, 1987. Research Triangle Park, NC, Instrument Society of America, 1987, p. 479-486.

The Hubble Space Telescope (HST) will be an orbiting observatory which will extend the capability of large earth-based observatories to view the universe by approximately 350 times in volume and approximately seven times in distance. The HST program, which includes the Orbiting Observatory, the Space Telescope Science Institute, and the Space Telescope Operations Control Center, is supported by the Space Shuttle, the Tracking and Data Relay Satellite System, and the NASA Communications Network. This paper describes the Command and Data Management System for the HST spacecraft, including flexibility, operation modes, and end-to-end data flow paths used to meet stringent synchronization and data quality requirements. The results of system tests indicate that the use of concatenated coding techniques consisting of both block and convolutional codes as a protection against random and burst errors has been successful. Diagrams of the HST data system are included. I.S.

A88-35376

ADVANCED HELICOPTER COCKPIT INFORMATION MANAGEMENT

STEVE MARTZ (Boeing Military Airplane Co., Wichita, KS), CATHY LEININGER, and JIM DACUS (Boeing Computer Services Co., Wichita, KS) IN: Rotorcraft flight controls and avionics; Proceedings of the National Specialists' Meeting, Cherry Hill, NJ, Oct. 13-15, 1987. Alexandria, VA, American Helicopter Society, 1987, 8 p. refs

The growing complexity of advanced helicopter systems has increased pilot workload. Human-machine interface characteristics and thus mission performance are adversely affected by less than optimal integration of information from complex helicopter systems. Expert system technology offers great potential for alleviating the pilot workload associated with making routine as well as exceptional decisions as to information to be displayed. The numerous possible combinations of display information can be intelligently filtered by an expert system dedicated to cockpit information management. An additional benefit is the flexibility obtained through an expert system implementation of a cockpit information manager. This paper describes a prototype expert system developed to demonstrate these benefits. Author

A88-35463

THE EFFECTS OF DIFFERENT DATA BASE FORMATS ON INFORMATION RETRIEVAL

DEBORAH BOEHM-DAVIS, ROBERT HOLT, MATTHEW KOLL, GLORIA YASTROP, and ROBERT PETERS (George Mason University, Fairfax, VA) IN: Human Factors Society, Annual Meeting, 31st, New York, NY, Oct. 19-23, 1987, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1987, p. 983-986.

(Contract N00014-85-K-0243)

This research examined the effects of three different data-base formats on the information retrieval performance of users. Spatial, tabular, and verbal forms of two data-base domains (airline and thesaurus) were constructed along with questions that required users to search through the data base to determine the correct response. Three types of questions were designed: spatial, tabular, and verbal. The data indicate that users are faster and more accurate in responding to the questions when the format of the information in the data base matches the type of information

needed to answer the question. While the importance of matching data base format to query type may seem to be obvious, it would appear that the designers of most current data base systems have not taken this into account. Author

A88-36546

AI AND ATLAS - THE PROSPECTS FOR A MARRIAGE

ROY T. OISHI (ManTech Support Technology, Inc., Alexandria, VA) IN: AUTOTESTCON '87; Proceedings of the International Automatic Testing Conference, San Francisco, CA, Nov. 3-5, 1987. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 161-166.

The possibility of combining the ATLAS language, used for sequential diagnostic test programs, with expert system technology is explored. Extensions to ATE (automatic test equipment) software architectures needed to combine these two technologies are proposed. The advantages of such an approach are discussed. I.E.

A88-38690* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SATELLITE DATA MANAGEMENT FOR EFFECTIVE DATA ACCESS

PATRICK D. HOGAN and THOMAS L. KOTLAREK (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: International Conference on Data Engineering, 3rd, Los Angeles, CA, Feb. 3-5, 1987, Proceedings. Washington, DC, IEEE Computer Society Press, 1987, p. 494-500.

The management of data generated from satellite missions has not always led to effective access of that data by the scientific community. NASA has tried to alleviate this problem for ocean scientists, by initiating a program, the NASA Ocean Data System (NODS). The menu-based user interface that NODS employs allows a user to make request and receive answers within a short time of accessing the system. A catalog system, which holds information about oceanographic data sets may be queried to determine the suitability of a particular data set. Once a candidate data set is found, the user is directed to the person or place which actually holds the data. NODS also has an archive system that holds data from ocean-observing satellites. The archive may be queried to obtain a manageable data subset that can be delivered in a useful form. Author

A88-39049

MAINTAINING LARGE PLANNING SYSTEMS DURING RAPID TECHNOLOGICAL CHANGE

JOHN M. MULVEY (Princeton University, NJ) and STAVROS A. ZENIOS (Pennsylvania, University, Philadelphia) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, Feb. 1988, p. 31-36. Research supported by the Sloan Foundation. refs (Contract NSF DCR-84-01098)

Today in the United States, large computerized planning systems have become accepted managerial tools. Four prominent examples taken from ongoing public sector projects are described. The proliferation of computerized databases, greatly reduced costs for computer hardware, new efficient algorithms, and analytically trained managers have all contributed to this acceptance. Expanded use of large-scale planning systems depends upon project managers taking advantage of future breakthroughs in computer hardware and software. Of particular concern are the design of forthcoming supercomputers and the impact of these designs on software planning systems. Three recommendations are presented. Author

A88-42201

WHAT EVERY GOOD MANAGER SHOULD KNOW ABOUT ADA

JUDY BAMBERGER (TRW, Inc., TRW Defense Systems Group, Redondo Beach, CA) IEEE Aerospace and Electronic Systems Magazine (ISSN 0885-8985), vol. 3, May 1988, p. 2-8. refs

The author discusses fears and fantasies about Ada that she has heard, directly or indirectly, each of them a number of times,

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from people holding a variety of management and nonmanagement positions, working for the government and for government contractors, and with a wide range of technical backgrounds. She examines them from three points of view: the US Department of Defense program office view; the contractor project management view; and the design and implementation team view. Her goal is to help project managers discriminate facts about Ada from fears and fantasies and thus ensure its successful use. I.E.

A88-44893*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

FLUID DYNAMICS PARALLEL COMPUTER DEVELOPMENT AT NASA LANGLEY RESEARCH CENTER

JAMES C. TOWNSEND, THOMAS A. ZANG, and DOUGLAS L. DWOYER (NASA, Langley Research Center, Hampton, VA) IN: Parallel computations and their impact on mechanics; Proceedings of the Symposium, ASME Winter Annual Meeting, Boston, MA, Dec. 13-18, 1987. New York, American Society of Mechanical Engineers, 1987, p. 333-343. refs

To accomplish more detailed simulations of highly complex flows, such as the transition to turbulence, fluid dynamics research requires computers much more powerful than any available today. Only parallel processing on multiple-processor computers offers hope for achieving the required effective speeds. Looking ahead to the use of these machines, the fluid dynamicist faces three issues: algorithm development for near-term parallel computers, architecture development for future computer power increases, and assessment of possible advantages of special purpose designs. Two projects at NASA Langley address these issues. Software development and algorithm exploration is being done on the FLEX/32 Parallel Processing Research Computer. New architecture features are being explored in the special purpose hardware design of the Navier-Stokes Computer. These projects are complementary and are producing promising results. Author

A88-45032

THE STANDARDISATION OF ON-BOARD DATA MANAGEMENT SYSTEMS AND ITS IMPACT ON GROUND SYSTEMS

MICHAEL JONES and NIGEL HEAD (ESA, Data Processing Div., Darmstadt, Federal Republic of Germany) British Interplanetary Society, Journal (ISSN 0007-084X), vol. 41, July 1988, p. 295-300.

In order to assess the possible impacts of present and future standardization efforts, a classification of the areas on on-board hardware and software that are amenable to standardization is made. Emphasis is given to the standardization of software, including that for both space and ground segments. The approach adopted is to match the data flow in the ground-space system to the standard OSI seven-layer model of communications. A number of inconsistencies or difficulties in performing this match are identified, using, as a basis, an assumed ground-space system architecture similar to that adopted for previous ESA missions. A number of areas are identified in which it appears that the definition and adoption of standards would be of most benefit with regard to either decreasing costs or increasing the quality and reliability of the final product. Author

A88-45034

DATA MANAGEMENT FOR LARGE SPACE SYSTEMS

C. J. SHELFORD (British Aerospace, PLC, Space and Communications Div., Stevenage, England) British Interplanetary Society, Journal (ISSN 0007-084X), vol. 41, July 1988, p. 307-309.

This paper examines the major tasks and features of an on-board data management system (DMS) being currently designed for large space systems. The special features of this DMS will include high damage tolerance, ability to provide communications between a large number of dissimilar data sources and to transfer data at high speed, high flexibility in terms of system operation and growth, and easy maintenance and servicing. A major element of the DMS is the data network which will be implemented as a 'local area network' and which will transport data between users

at rates compatible with users' requirements. The network interfaces will be made simple, reliable, and effective and of a complexity consistent with the mission objectives. I.S.

A88-46023* Maryland Univ., College Park.

MODERN METEOROLOGICAL COMPUTING RESOURCES - THE MARYLAND EXPERIENCE

GEORGE J. HUFFMAN (Maryland, University, College Park) American Meteorological Society, Bulletin (ISSN 0003-0007), vol. 69, July 1988, p. 736-742. Research supported by the University of Maryland. refs
(Contract NAGW-557; NAGW-558; NAG5-215; NSF ATM-84-09457; NSF ATM-84-14660; NSF ATM-85-06446; NSF ATM-86-19491; NSF MDR-85-11424)

The Department of Meteorology at the University of Maryland is developing one of the first computer systems in meteorology to take advantage of the new networked computer architecture that has been made possible by recent advances in computer and communication technology. Elements of the department's system include scientific workstations, local mainframe computers, remote mainframe computers, local-area networks, 'long-haul' computer-to-computer communications, and 'receive-only' communications. Some background is provided, together with highlights of some lessons that were learned in carrying out the design. In agreement with work in the Unidata Project, this work shows that the networked computer architecture discussed here presents a new style of resources for solving problems that arise in meteorological research and education. Author

A88-46506

INFORMATION SYSTEMS: FAILURE ANALYSIS; PROCEEDINGS OF THE NATO ADVANCED RESEARCH WORKSHOP, BAD WINDSHEIM, FEDERAL REPUBLIC OF GERMANY, AUG. 18-22, 1986

JOHN A. WISE, ED. (Westinghouse Research and Development Center, Pittsburgh, PA) and ANTHONY DEBONS, ED. (Pittsburgh, University, PA) Workshop sponsored by NATO, Aluminum Company of America, and U.S. Army. Berlin and New York, Springer-Verlag (NATO ASI Series. Volume F32), 1987, 352 p. For individual items see A88-46507 to A88-46514.

Topics discussed include the systemic aspects of information system failure, investigative methods for the analysis of information system failure, and human and technological issues in failure analysis. Particular papers are presented on system failure as a result of design inadequacy, the investigative techniques used by the Presidential Commission on the Spacex Shuttle Challenger Accident, the use of expert systems in information systems, aviation accidents as due to failures of information management, and AI techniques for the distribution of critical information. B.J.

A88-46951

1987 ANNUAL SUMMER COMPUTER SIMULATION CONFERENCE, 19TH, MONTREAL, CANADA, JULY 27-30, 1987, PROCEEDINGS

JORDAN Q. B. CHOU, ED. (Ontario Hydro, Toronto, Canada) Conference sponsored by the Society for Computer Simulation. San Diego, CA, Society for Computer Simulation, 1987, 1065 p. For individual items see A88-46952 to A88-46987.

Various papers on computer simulation are presented. The general topics addressed include: simulation methods, computer systems, simulation credibility and validation, physical and engineering sciences, radar and communication systems simulation, chemical sciences, energy, biomedical simulation, environmental sciences, management and the social sciences. Also considered are: training and research simulators, government simulation/computation activities, CAD/CAM and manufacturing systems, artificial intelligence, simulation of discrete systems, flight simulation systems, military and defense systems, simulation of control and automation systems, Strategic Defense Initiative, and transportation systems. C.D.

A88-47005* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

DEVELOPMENT OF THE NASA/FLAGRO COMPUTER PROGRAM

ROYCE G. FORMAN (NASA, Johnson Space Center, Houston, TX), VANKATARAMAN SHIVAKUMAR, SUSAN M. PIOTROWSKI, LEONARD C. WILLIAMS (Lockheed Engineering and Management Services Co., Inc., Houston, TX), and JAMES C. NEWMAN, JR. (NASA, Langley Research Center, Hampton, VA) IN: Fracture mechanics. Philadelphia, PA, American Society for Testing and Materials, 1988, p. 781-803. refs

A preliminary version of a new computer program has been developed for calculating crack propagation in cyclically loaded structures. The new program, titled NASA/FLAGRO, has numerous enhanced features over previous programs used for safe life analysis on space systems. The essential features of the new program consist of modular design, promptive input using a cathode ray tube terminal, improved crack growth rate analytical methods, many new crack case solutions, and incorporation of user-defined files for material properties and fatigue spectrums. Also, five options made available in the program are to compute: (1) safe life of a part with a preexisting crack; (2) critical crack size for a specified stress level; (3) stress-intensity factor numerical values for making comparisons or checks of solutions; (4) least-squares fit of growth rate equations to crack growth rate data; and (5) the conversion of a versus N data to Delta K versus da/dN. Author

A88-50319

ADVANCES IN IMAGE PROCESSING; PROCEEDINGS OF THE MEETING, THE HAGUE, NETHERLANDS, MAR. 31-APR. 3, 1987

ANDRE OOSTERLINCK, ED. (Leuven, Katholieke Universiteit, Heverlee, Belgium) and ANDREW G. TESCHER, ED. (Technology Concepts Associates, Claremont, CA) Meeting organized by the Association Nationale de la Recherche Technique and SPIE. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Volume 804), 1987, 409 p. For individual items see A88-50320 to A88-50322. (SPIE-804)

Advances in image-processing methods and applications are examined in reviews and reports. Topics discussed include optical technology in the Netherlands, algorithms and theory, image-processing architectures, medical applications, industrial applications, and image coding. Particular attention is given to IRAS image reconstruction and restoration, a hierarchical method for classification of high-resolution remotely sensed multispectral images, distance measurements in X-ray images, a component labeling algorithm for video rate processing, moment invariance for perspective transformation, and hierarchical picture coding using quad-tree decomposition. T.K.

A88-50874

THE MISSING LINKS - ADVANCES IN GRAPHIC PROCESSING OF FINITE ELEMENT MODELING INFORMATION

GERARD A. BRENNAN (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) IN: International Modal Analysis Conference, 5th, London, England, Apr. 6-9, 1987, Proceedings. Volume 2. Bethel, CT, Society for Experimental Mechanics, Inc., 1987, p. 1263-1268.

Graphic processing of finite element modeling (FEM) data has provided analysts with a quick and effective way to comprehend the large volumes of analysis information. The complexity and completeness of the pre- and postprocessing capabilities provided by FEM graphics systems generally depends on both cost and computing resources. These graphics systems are available on mainframes, turnkey systems, mini-, micro-, and personal computers. The widespread availability and acceptance of these systems has increased the awareness of FEM efforts both within and outside of the engineering community. However, the element topology representations used in most graphics systems are often simplistic and misleading. This paper presents an innovative method for a more complete representation of finite element topologies and properties. Author

A88-50987

SOFTWARE BLUEPRINTING FOR LOGISTICS SOFTWARE ENGINEERING

DEBORAH A. JANSACK-NOBLE (BDM Corp., Dayton, OH) IN: NAECON 88; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 23-27, 1988. Volume 2. New York, Institute of Electrical and Electronics Engineers, 1988, p. 636-640. refs

The effectiveness of the Logistics Management System Center (LMSC) modernization program relies on the development of large, high quality, integrated information systems. Since software production is complicated by errors at every stage of development, it is critical to implement whatever cost effective processes are necessary to create the best systems possible. The author presents an overview of the three laws of information engineering, how they effect logistics software development, and the development and application of the copyrighted BDM software blueprinting methodology as a partial solution. I.E.

A88-51006

HUMANE: A KNOWLEDGE-BASED SIMULATION ENVIRONMENT FOR HUMAN-MACHINE FUNCTION ALLOCATION

AZAD M. MADNI (Perceptronics, Inc., Woodland Hills, CA) IN: NAECON 88; Proceedings of the IEEE National Aerospace and Electronics Conference, Dayton, OH, May 23-27, 1988. Volume 3. New York, Institute of Electrical and Electronics Engineers, 1988, p. 860-866. Research supported by Perceptronics, Inc. refs (Contract F33615-86-C-0536)

The human-machine allocation network-based environment (HUMANE), a designer-oriented knowledge-based simulation environment for analyzing function-allocation options, is presented. The requirements for a designer-oriented function allocation tool are presented, followed by the design methodology, overall concept of operation, hardware-software implementation, potential enhancements and transfer strategy. HUMANE both systematizes and formalizes the function allocation process. Its 'what-if' simulation-based analysis capability produces dramatic savings in designers' time-on-task while comprehensively covering performance and workload envelopes. The knowledge-based implementation makes the software inspectable, maintainable and modular. Its graphical interfaces are both easy-to-use. HUMANE allows the designer to save both selected and rejected Function-allocation options (along with a brief reason) in the lessons-learned data bases. This feature offers great utility in subsequent analysis of other platforms and systems. I.E.

A88-51934#

THE SPECIFICATION AND DESIGN OF A SYSTEM USING COMPUTER-AIDED SOFTWARE ENGINEERING AND PERFORMANCE ANALYSIS TOOLS

B. E. CLARK, JANET R. DUNHAM, and DEBORAH L. FRANKE (Research Triangle Institute, Research Triangle Park, NC) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 8 p. refs (AIAA PAPER 88-4410)

The combined use of computer-aided software engineering (CASE) and architecture design and assessment system (ADAS) methods for designing complex digital systems such as a guidance and control system is considered. Both CASE and performance analysis tools provide the consistency checking which is necessary to ensure a correct specification, and CASE tools provide extensive documentation features such as data dictionaries and the automatic generation of MIL STD 2167 specifications. ADAS tools provide an event list for ensuring correct performance in a real-time system, along with mapping capabilities which allow hardware constraints to be included in the analysis. R.R.

A88-51956#

1993 - A VISION OF THE DESIGN CENTER

CARL W. DAWSON (Apollo Computer, Inc., Atlanta, GA) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting,

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Atlanta, GA, Sept. 7-9, 1988. 10 p. refs
(AIAA PAPER 88-4451)

The ability to interconnect different computer systems and to share data and processing power has been made possible by the implementation of various standards. The power of new and emerging hardware and software technologies will have a profound impact on the way new applications are developed and how an organization will use computer resources within the next five years. Author

A88-52132

VSAT NETWORKS: ARCHITECTURES, PROTOCOLS, AND MANAGEMENT

DATTAKUMAR M. CHITRE (COMSAT Laboratories, Clarksburg, MD) and JOHN S. MCCOSKEY (GTE Spacenet Corp., McLean, VA) IEEE Communications Magazine (ISSN 0163-6804), vol. 26, July 1988, p. 28-38.

VSAT (very-small-aperture terminal) satellite networks, are discussed, focusing on a particular network called STARCOM. The STARCOM system architecture is presented. A multiple-access protocol developed specifically for the STARCOM system is described and its performance is examined. The management capabilities of the STARCOM system are considered in detail.

I.E.

A88-52229#

ADVANCED BLACKBOARD APPROACHES FOR COCKPIT INFORMATION MANAGEMENT

L. BAUM, R. DODHIWALA, V. JAGANNATHAN (Boeing Computer Services Co., Seattle, WA), D. BLEVINS, and R. STENERSON (Boeing Military Airplane Co., Seattle, WA) IN: AAAIC '87 - Aerospace Applications of Artificial Intelligence; Proceedings of the Third Annual Conference, Dayton, OH, Oct. 5-9, 1987. Dayton, OH, AAAIC Conference Secretariat, 1988, p. 15-30. refs

Effective management of the cockpit environment requires a sophisticated control technology which embodies the 'contract' between the pilot and his intelligent cockpit information management system, which responds asynchronously to the event driven flight environment, and which manages visual displays and synthesized voice channels to aid the pilot in maintaining his flight context. The Avionics Technology Group of the Boeing Military Airplane Company has employed the 'blackboard' programming paradigm to develop a sequence of prototype cockpit information management systems of increasing complexity and capability. The work reported here is an extension of earlier work which replaces the simple domain blackboard software with blackboard software having both a control and a domain component developed by Boeing Computer Services. The new cockpit information management systems implemented in this technology provide the capability to dynamically allocate priorities of pending tasks.

Author

A88-52343

ADA AND KNOWLEDGE-BASED SYSTEMS - A PROTOTYPE COMBINING THE BEST OF BOTH WORLDS

DAVID C. BRAUER, PATRICK P. ROACH, MICHAEL S. FRANK, and RICHARD P. KNACKSTEDT (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 6-36 to 6-40. refs

A software architecture based on Ada tasking and packaging which facilitates the construction of distributed knowledge-based systems is described. This architecture was used to build the Knowledge-Based Maintenance Expert System prototype for the Remote Manipulator System of the NASA Space Station Mobile Service Center. Each module of the system contains Ada packages of standard systems services, which interface with an artificial intelligence/knowledge-based system (AI/KBS) language component that performs knowledge-based reasoning. By using Ada as the fundamental structure, a well-structured, maintainable program was achieved. By retaining the AI/KBS language

component, the knowledge needed to solve ill-structured, dynamic, and/or nonalgorithmic problems was captured. Author

A88-52357

SOFTWARE ENGINEERING DEVELOPMENT ENVIRONMENT FOR THE LAUNCH PROCESSING SYSTEM

MARCIA W. BURCH and DEBRA K. MOYER IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 9-77 to 9-85.

A networked computing system which generates a state-of-the-art environment for software engineering was developed to support a progressive Shuttle launch rate. The launch processing system software development network is a 12 megabit/sec token passing ring architecture connecting individual nodes in a series. The network topology is described as well as system implementation, the goal compiler, CCMS development support, Shuttle connector analysis, computer aided graphics, configuration management, the switch controller prototype, and documentation support. K.K.

A88-53669#

SOFTWARE TOOLS FOR BUILDING DEDICATED, REALTIME APPLICATIONS

B. COTHRAN and D. COMSTOCK (Digital Equipment Corp., Maynard, MA) IN: AIAA, Flight Simulation Technologies Conference, Atlanta, GA, Sept. 7-9, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 343-346. (AIAA PAPER 88-4650)

A set of software tools used for building dedicated real-time applications is described qualitatively and quantitatively. It is shown how a single computer architecture, with the use of a sophisticated set of software tools, can be used to build real-time applications requiring single and/or multiprocessing systems. Standard product features such as ADA TM support, remote debugger, and performance analysis utilities are discussed. K.K.

A88-54484

A DATA-BASE MANAGEMENT SCHEME FOR COMPUTER-AIDED CONTROL ENGINEERING

JAMES H. TAYLOR, KO-HAW NIEH (General Electric Co., Schenectady, NY), and PETER A. MROZ (DuPont Chambers Works, Deepwater, NJ) IN: 1988 American Control Conference, 7th, Atlanta, GA, June 15-17, 1988, Proceedings. Volume 1. New York, Institute of Electrical and Electronics Engineers, 1988, p. 719-724. USAF-sponsored research. refs

As CACE (computer-aided control engineering) environments become more comprehensive and more powerful, the need for keeping track of the models, simulations, analysis results, control system designs, and validation study results over the control system design cycle becomes more pressing and the lack of engineering-database-management support becomes more of an impediment to effective controls engineering. In view of this, the authors demonstrate that rigorous engineering-database management for computer-aided control engineering is both important and achievable. A hierarchical organization of CACE database elements is presented, and additional mechanisms for maintaining database integrity are described. I.E.

A88-54485

AN INTERFACE FOR COMPUTER-AIDED CONTROL ENGINEERING BASED ON AN ENGINEERING DATA-BASE MANAGER

PETER A. MROZ (DuPont Chambers Works, Deepwater, NJ), PHIL MCKEEHEN (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH), and JAMES H. TAYLOR (GE Control Systems Laboratory, Schenectady, NY) IN: 1988 American Control Conference, 7th, Atlanta, GA, June 15-17, 1988, Proceedings. Volume 1. New York, Institute of Electrical and Electronics Engineers, 1988, p. 725-730. USAF-sponsored research. refs

The features of an engineering-database-management (EDBM)-based user interface to a CACE software environment

are described. This includes demonstrating the execution of all database operations, including browse, display, edit, purge, delete, and replicate, as well as executing certain CACE activity directly from the EDBM displays. Some of these features have been implemented in a rapid prototype software environment; more of them are currently being incorporated in version 1.0 of the authors' CACE environment. The primary goal of this user-interface design is to make EDBM an integral part of the environment. I.E.

A88-55015

SATELLITE INFORMATION SYSTEMS

EDWARD S. BINKOWSKI (Strategic Comaps, Inc.; Hunter College; Fordham University, New York) Boston, MA, G.K. Hall Publishers, 1988, 223 p. refs

Commercial applications of satellite technology are discussed in a general overview for potential users. Chapters are devoted to satellite information systems (including one-to-one, one-to-many, and many-to-one information transfer), regulation and competition in satellite communications, and a survey of currently open questions for users and operators. Directories of relevant publications and associations are provided. T.K.

A88-55330*#

SPACE STATION INFORMATION SYSTEMS

CLARENCE W. PITTMAN (NASA, Space Station Program Office, Reston, VA) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 10 p. (IAF PAPER 88-059)

The utility of the Space Station is improved, the ability to manage and integrate its development and operation enhanced, and the cost and risk of developing the software for it is minimized by three major information systems. The Space Station Information System (SSIS) provides for the transparent collection and dissemination of operational information to all users and operators. The Technical and Management Information System (TMIS) provides all the developers with timely and consistent program information and a project management 'window' to assess the project status. The Software Support Environment (SSE) provides automated tools and standards to be used by all software developers. Together, these three systems are vital to the successful execution of the program. Author

N88-10686*# Denver Univ., CO. Program for the Management and Application of Science and Technology.

NASA'S NEW TECHNOLOGY REPORTING SYSTEM: A REVIEW AND FUTURE PROSPECTS

RICHARD L. CHAPMAN Jun. 1985 205 p (Contract NASW-3466)

(NASA-CR-180954; NAS 1.26:180954) Avail: NTIS HC A10/MF A01 CSCL 05B

A systematic effort is made to describe how NASA's new technology reporting system operates today, and how that system might be enhanced. The system is documented in terms of organization, operational practices, and other program benefits. Identified and assessed are incentives or disincentives to reporting, program management, program follow through, and the feasibility of various means for improving the general process. NASA has the only system in the Federal Government for capturing and disseminating new technology developed under its sponsorship of research and development. This system can be improved in many ways, some of which require additional resources and/or more senior management attention, but many of which can be instituted within the authority of the leadership of the Technology Utilization program. The suggested options and actions presented are mutually compatible. Any single action will contribute to improving the process. However, the first and most important step is undoubtedly to gain senior management's attention to the central role played by a vigorous new technology reporting system in the success and value of NASA's broader technology utilization and technology transfer activities. Author

N88-11377# Rockwell International Corp., Golden, CO.

PERSONAL COMPUTERS: A POWERFUL TOOL FOR PROJECT MANAGEMENT

T. A. HUGHES 1987 11 p Presented at the Instrument Society of America International Conference and Exhibit, Anaheim, Calif., 5 Oct. 1987

(Contract DE-AC04-76DP-03533)

(DE87-013381; RFP-4104; CONF-871028-4) Avail: NTIS HC A03/MF A01

Availability of low cost hardware and software within the past few years has made the Personal Computer a powerful tool for Project Management. Project managers very effectively apply word processing, cost accounting spreadsheets, and data management software to make their jobs easier. An important aspect of personal computers lies in their ability to improve productivity of the project design team. Project information can now be gathered, stored, and presented in a more useful form. Direct benefits are the detecting of cost overruns and scheduling problems through improved data analysis. This paper will discuss the use of Personal Computers in cost analysis, planning, tracking, and controlling instrumentation projects. Practical applications will be discussed and the advantages and disadvantages of available software will be reviewed. DOE

N88-11378# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.

THE MICROCOMPUTER AS AN ENGINEERING MANAGEMENT TOOL

J. A. GOLDSBERRY and T. R. HOERTKORN 1987 9 p Presented at the Society of Women Engineers National Convention, Kansas City, Mo., 24 Jun. 1987 Prepared in cooperation with DOE, Idaho Falls, Idaho

(Contract DE-AC07-76ID-01570)

(DE87-014882; EGG-M-37586; CONF-870669-2) Avail: NTIS HC A02/MF A01

Project management is a concern for engineers who need to track critical technical and financial data to accomplish tasks. Conservation personnel are currently using physical files to store project data. When data are needed, it is not always easily accessible. The manual approach is becoming increasingly difficult as the number of active projects increase. The mini-computer approach is functional but requires a large investment for hardware and software. Therefore, a microcomputer-based relational database management system (DBMS) is being implemented to improve operating efficiency and decision support for the Conservation Programs at INEL and the Conservation Technologies Division at DOE-ID. Managers and technical monitors can easily access the database to check the current status of projects. The application is designed to work in conjunction with a natural language inquiry product that allows retrieval of database information in plain English. DOE

N88-11571# Center for Social and Economic Issues, Ann Arbor, MI.

IMPLEMENTING AND MANAGING CHANGE: A GUIDE FOR ASSESSING INFORMATION TECHNOLOGY

J. A. MORELL, R. GRYSER, and M. FLEISCHER Aug. 1987 100 p Prepared in cooperation with ORNL, Tenn.

(Contract DE-AC05-84OR-21400)

(DE88-000035; ORNL/TM-10520) Avail: NTIS HC A05/MF A01

Assessing the impact of office automation (OA) requires expertise in the generic aspects of evaluation and innovation adoption, combined with specialized knowledge of OA. There is an extensive literature on the two generic subjects, but no companion literature concerning the application of the knowledge to the unique case of OA. By providing that specialized information, this report assists the implementors of OA in two ways: it shows them how to monitor implementation efforts, thus providing feedback to facilitate adoption of OA technology; and it provides guidance for measuring OA's impact on people and organizations. The report assumes an immediate impact of OA on the work groups where the technology is implemented, and a continually spreading effect from that locus of immediate use. Included in the

05 COMPUTERS AND INFORMATION MANAGEMENT

report are discussions of: sources of data, methods of data collection, factors which affect implementation, and measures of impact. Special attention is given to measuring productivity changes that may result from the use of OA. A detailed appendix supplies a variety of examples which show how the variables discussed in the report were actually measured in applied settings. DOE

N88-11925*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

LEWIS INFORMATION NETWORK (LINK): BACKGROUND AND OVERVIEW

ROGER R. SCHULTE Nov. 1987 34 p
(NASA-TM-100162; E-3724; NAS 1.15:100162) Avail: NTIS HC A03/MF A01 CSCL 17B

The NASA Lewis Research Center supports many research facilities with many isolated buildings, including wind tunnels, test cells, and research laboratories. These facilities are all located on a 350 acre campus adjacent to the Cleveland Hopkins Airport. The function of NASA-Lewis is to do basic and applied research in all areas of aeronautics, fluid mechanics, materials and structures, space propulsion, and energy systems. These functions require a great variety of remote high speed, high volume data communications for computing and interactive graphic capabilities. In addition, new requirements for local distribution of intercenter video teleconferencing and data communications via satellite have developed. To address these and future communications requirements for the next 15 yrs, a project team was organized to design and implement a new high speed communication system that would handle both data and video information in a common lab-wide Local Area Network. The project team selected cable television broadband coaxial cable technology as the communications medium and first installation of in-ground cable began in the summer of 1980. The Lewis Information Network (LINK) became operational in August 1982 and has become the backbone of all data communications and video. Author

N88-12333# Vanderbilt Univ., Nashville, TN. Center for Intelligent Systems.

A PROTOTYPE EXPERT SYSTEM FOR SEPARATION SCIENCE

K. A. DEBELAK, M. R. LEUZE, J. R. BOURNE, J. E. WHITLOW, B. A. ANTAO, O. PATINO-SILICEO, and D. J. PRUETT (Oak Ridge National Lab., Tenn.) Aug. 1987 14 p Presented at the American Institute of Chemical Engineers Summer National Meeting, Minneapolis, Minn., 16 Aug. 1 1987 Prepared in cooperation with Oak Ridge National Lab., TN.
(Contract DE-AC05-84OR-21400)
(DE87-013542; CONF-870822-7) Avail: NTIS HC A02/MF A01

The creation of an expert system that will aid in solving problems in separation science and technology is discussed. Such a system includes a user interface and a core expert system with the ability to access a number of modules designed to retrieve, calculate, and analyze information needed to solve separation problems. These modules include an analytical chemistry data base, existing chemical data bases, regulatory data base, theoretical models, engineering models, and a series of expert systems in each of the important separation technologies. DOE

N88-12417# Oak Ridge National Lab., TN. **THE IMPACT OF INFORMATION TECHNOLOGY ON RESEARCH IN SCIENCE AND ENGINEERING**

JONATHAN A. MORELL 1987 29 p Presented at the Howard R. Davis Society for Knowledge Utilization, Pittsburgh, Pa., 9 Oct. 1987
(Contract DE-AC05-84OR-21400)
(DE88-000342; CONF-8710147-1) Avail: NTIS HC A03/MF A01

There is little research on the impact of information technology (IT) on how research is carried out by scientists and engineers. This paper draws on other bodies of writings which indirectly shed light on this question. Included are: the role of calculation in research, scientific productivity, the philosophical underpinnings of science and technology, systems analysis, and the use of computer aided design in engineering. A model is developed which helps

identify the types of impact that IT may have on social system and epistemological aspects of research. Factors are hypothesized which may explain why IT may have particular effects in any given research endeavor. DOE

N88-12954*# Sterling Software, Palo Alto, CA. **SOFTWARE MAINTENANCE IN SCIENTIFIC AND ENGINEERING ENVIRONMENTS: AN INTRODUCTION AND GUIDE**

DAVID WRIGHT Feb. 1986 27 p
(Contract NAS2-11555)
(NASA-CR-177409; NAS 1.26:177409; USAAVSCOM-TR-85-A-5)
Avail: NTIS HC A03/MF A01 CSCL 09B

The purpose of software maintenance techniques is addressed. The aims of perfective, adaptive and corrective software maintenance are defined and discussed, especially in the NASA research environment. Areas requiring maintenance, and tools available for this, and suggestions for their use are made. Stress is placed on the organizational aspect of maintenance at both the individual and group level. Particular emphasis is placed on the use of various forms of documentation as the basis around which to organize. Finally, suggestions are given on how to proceed in the partial or complete absence of such documentation. Author

N88-14038# Science Research Council, Chilton (England). Rutherford Appleton Lab.

RELATIONAL DATA HANDLING SYSTEM FOR SCIENTISTS

B. J. READ 1986 21 p
(PB87-223426; RAL-86-053) Avail: NTIS HC E03/MF E03
CSCL 05B

Scientific applications may make special demands of a data base management system. It must not just cope with arrays and floating point numbers, but rather, recognize the different style in which data are used compared with ordinary commercial systems. R-EXEC was developed in response to the need for a simple, portable, relational file manipulation package in the FORTRAN environment. Relational algebra provides a firm theoretical foundation. This is then necessarily extended to handle data input, output, sorting, reports and graphs. The novel command interface is precedural and user efficient. The development of R-EXEC was strongly influenced by the immediate demands of applications in physics and astronomy. Apart from character strings, there are five numeric data types, all of which can be vectors. The data relations are self describing files, owned and managed by users without reference to a database administrator, and with no central schema to maintain. Particularly powerful data manipulation tools are the grouping operation, the outer join and the way functions of attributes are permitted in projection. Null, or default, values are optional. However, perhaps the most important attraction is the ease of adding new functions. Author

N88-14039# National Technical Information Service, Springfield, VA.

ROLE OF TECHNICAL INFORMATION IN INNOVATION

J. E. CLARK and A. R. WENBERG 30 Aug. 1987 17 p
Presented at the 194th American Chemical Society National Meeting, New Orleans, La., 30 Aug. - 4 Sep. 1987
(PB87-235388) Avail: NTIS HC A03/MF A01 CSCL 05B

Innovation results from the acquisition and use of technical information are presented. Scientific journals are frequently used by academic and other researchers to summarize their research results while technical reports are used widely by academics, governments, and business to document their research and development results in more detail. Other products of research and development efforts such as patents, computer software, and technical data complete the toolbox which innovators and entrepreneurs need to accomplish change. The complementary roles of these various types of scientific and technical information are described. GRA

N88-14040# National Technical Information Service, Springfield, VA.

ROLE OF THE TECHNICAL REPORT IN TECHNOLOGICAL INNOVATION

J. F. CAPONIO and D. D. BRACKEN 1987 21 p Presented at the 5th International Conference of Scientific Editors, Hamburg, Fed. Republic of Germany, 14-19 Jun. 1987

(PB87-232500) Avail: NTIS HC A03/MF A01 CSCL 05B

The United States has followed a policy since World War II of permitting and encouraging the flow of technology to the free world nations. For more than forty years, the National Technical Information Service (NTIS) has served as the primary source for the collection and distribution of Government-sponsored research and engineering reports (TR's), research in progress summaries, computer programs, machine-readable data files, and applied technology. The scientific paper and the TR are examined, compared, and appraised as carriers of scientific and technical knowledge. In addition to characterizing the taxonomy of the TR, the respective roles and functions of the published paper and the unpublished TR are identified in the diffusion of scientific and technological knowledge. More importantly, arguments are advanced and evidence presented to prove why the TR is more important than the scientific paper in stimulating technological innovation in the United States today. GRA

N88-14850# Science Research Council, Chilton (England).

SCIENTIFIC DATA MANIPULATION IN A RELATIONAL DATABASE SYSTEM

B. J. READ Jul. 1986 10 p

(PB87-124400; RAL-86-084) Avail: NTIS HC E03/MF E03 CSCL 05B

Provided the user interface is well designed, extended relational algebra can be a powerful tool for handling scientific data. Its utility is greatly enhanced by the addition of attribute algebra to allow mathematical manipulation of field values. The paper reports on a development which, motivated by practical requirements, integrates features such as functions, vector data types, iteration and conditional attribute values into a relational database management system. GRA

N88-14859*# Illinois State Univ., Normal. Dept. of Applied Computer Science.

A REVIEW OF HYPERTEXT IN A NASA PROJECT MANAGEMENT CONTEXT Final Report

CHRISTOPHER J. BELL /in NASA. Lyndon B. Johnson Space Center, Houston, Tex. NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1987. Volume 1 12 p Nov. 1987

Avail: NTIS HC A15/MF A01 CSCL 05B

The principles of data storage, the comparative strengths of data bases, and the evolution of hypertext within this context are discussed. A classification schema of indexing and of hypertext document structures is provided. Issues associated with hypertext implementation are also discussed and potential areas for further research are indicated. Author

N88-15725# Defense Technical Information Center, Alexandria, VA. Office of Information Syst Ems and Technology.

DOD GATEWAY INFORMATION SYSTEM (DGIS) COMMON COMMAND LANGUAGE: THE FIRST PROTOTYPING AND THE DECISION FOR ARTIFICIAL INTELLIGENCE

ALLAN D. KUHN, RANDY L. BIXBY, and DUC TIEN TRAN Aug. 1987 26 p

(AD-A185950; AD-F000114; DTIC/TR-87/19; DTIC-AI-FOUNDATION-SER-4) Avail: NTIS HC A03/MF A01 CSCL 05B

DoD gateway information system (DGIS) began its initial prototype in C language with DIALOG, BRS, NASA/RECON, and DROLS. These prototypes in a third-generation algorithmic language brought to the surface a number of problems and questions in dealing with the distinctions of information systems. The issues concern both the user interface and the development design. Experiences, results, and conclusions in working with these

systems are brought out. The decision to convert to and continue CCL development with artificial intelligence tools is explained. Our effort is a merging of PROLOG and C capabilities, to provide the DGIS user an AI-based searcher assistant interface that makes the human-machine interaction more human-like on DGIS. GRA

N88-15726# Defense Technical Information Center, Alexandria, VA. Office of Information Systems and Technology.

DOD GATEWAY INFORMATION SYSTEM (DGIS): COMMON COMMAND LANGUAGE MAPPING

RANDY L. BIXBY Oct. 1987 22 p

(AD-A185951; AD-F000114; DTIC/TR-87/20; DTIC-CCL-2) Avail: NTIS HC A03/MF A01 CSCL 05B

The DoD Gateway Information System (DGIS) Common Command Language (CCL) project was initiated to provide a single standard command language for searching any online database system. This report relates the requirements analysis for the initial CCL prototypes in C language. Requirements were determined of six online database systems: DROLS, DIALOG, NASA/RECON, BRS, ORBIT, and MATRIS, using the National Information Standards Organization (NISO) draft standard for Common Command Language as a basis. Four C prototypes were completed: DROLS, DIALOG, BRS, and NASA/RECON. At that time the decision was made to incorporate artificial intelligence capabilities into CCL, and the programming of the CCL translators was converted to PROLOG. Author (GRA)

N88-16414*# Alabama Univ., Huntsville. Dept. of Computer Science.

QUALITATIVE MODELS FOR PLANNING: A GENTLE INTRODUCTION

JAMES D. JOHANNES and JAMES R. CARNES /in NASA. Marshall Space Flight Center, Third Conference on Artificial Intelligence for Space Applications, Part 1 p 297-302 Nov. 1987

Avail: NTIS HC A18/MF A01 CSCL 09B

Qualitative modeling is the study of how the physical world behaves. These physical models accept partial descriptions of the world and output the possible changes. Current systems assume that the model is static and that physical entities do not effect change into the world. An approach to planning in physical domains and a working implementation which integrates qualitative models with a temporal interval-based planner are described. The planner constructs plans involving physical qualities and their behavioral descriptions. Author

N88-16424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE INTELLIGENT USER INTERFACE FOR NASA'S ADVANCED INFORMATION MANAGEMENT SYSTEMS

Abstract Only

WILLIAM J. CAMPBELL, NICHOLAS SHORT, JR., LARRY H. ROLOFS, and SCOTT L. WATTAWA (Science Applications Research, Landover, Md.) /in NASA. Marshall Space Flight Center, Third Conference on Artificial Intelligence for Space Applications, Part 1 p 359-360 Nov. 1987

Avail: NTIS HC A18/MF A01 CSCL 09B

NASA has initiated the Intelligent Data Management Project to design and develop advanced information management systems. The project's primary goal is to formulate, design and develop advanced information systems that are capable of supporting the agency's future space research and operational information management needs. The first effort of the project was the development of a prototype Intelligent User Interface to an operational scientific database, using expert systems and natural language processing technologies. An overview of Intelligent User Interface formulation and development is given. Author

N88-16577*# National Academy of Sciences - National Research Council, Washington, DC.

CRITICAL ISSUES IN NASA INFORMATION SYSTEMS Final Report

Jun. 1987 68 p

05 COMPUTERS AND INFORMATION MANAGEMENT

(Contract NASW-4124)
(NASA-CR-182380; NAS 1.26:182380; PB88-101027) Avail:
NTIS HC A04/MF A01 CSCL 05B

The National Aeronautics and Space Administration has developed a globally-distributed complex of earth resources data bases since LANDSAT 1 was launched in 1972. NASA envisages considerable growth in the number, extent, and complexity of such data bases, due to the improvements expected in its remote sensing data rates, and the increasingly multidisciplinary nature of its scientific investigations. Work already has begun on information systems to support multidisciplinary research activities based on data acquired by the space station complex and other space-based and terrestrial sources. In response to a request from NASA's former Associate Administrator for Space Science and Applications, the National Research Council convened a committee in June 1985 to identify the critical issues involving information systems support to space science and applications. The committee has suggested that OSSA address four major information systems issues; centralization of management functions, interoperability of user involvement in the planning and implementation of its programs, and technology. GRA

N88-17275*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
THE USE OF COMPUTER GRAPHIC SIMULATION IN THE DEVELOPMENT OF ROBOTIC SYSTEMS
KEN FERNANDEZ /in NASA. Lyndon B. Johnson Space Center, Houston, Texas. First Annual Workshop on Space Operations Automation and Robotics (SOAR 87) p 501-511 Oct. 1987
Previously announced in IAA as A87-15812
Avail: NTIS HC A23/MF A01 CSCL 09B

This paper describes the use of computer graphic simulation techniques to resolve critical design and operational issues for robotic systems. Use of this technology will result in greatly improved systems and reduced development costs. The major design issues in developing effective robotic systems are discussed and the use of ROBOSIM, a NASA developed simulation tool, to address these issues is presented. Three representative simulation case studies are reviewed: off-line programming of the robotic welding development cell for the Space Shuttle Main Engine (SSME); the integration of a sensor to control the robot used for removing the Thermal Protection System (TPS) from the Solid Rocket Booster (SRB); and the development of a teleoperator/robot mechanism for the Orbital Maneuvering Vehicle (OMV). Author

N88-17307# Logica Ltd., London (England).
HARDWARE/SOFTWARE RELIABILITY STUDY Final Report
PETER MELLOR Paris, France ESA Jan. 1987 261 p
(Contract ESA-6640/86-NL-MA)
(REPT-65.5686; ESA-CR(P)-2494; ETN-88-91427) Avail: NTIS
HC A12/MF A01

Techniques for reliability analysis of the logical part of hardware/software systems are reviewed, and recommendations for requirements and analysis techniques needed to demonstrate compliance are made. Working practices to be used to assess software reliability in order to demonstrate compliance with requirements, and a comprehensive technical background of techniques and tools which can be used to assess hardware/software reliability are presented. Working practices to be used in collecting data for an assessment of software reliability are included, because of the nature of software reliability assessment techniques which involves a statistical analysis of the failure history of a system during trial. It is therefore essential that the necessary data be recorded during development, test, trial, and operation of a hardware/software system. ESA

N88-18191# North Carolina Univ., Raleigh. Dept. of Electrical and Computer Engineering.
PROCEEDINGS OF THE WORKSHOP ON FUTURE DIRECTIONS IN COMPUTER ARCHITECTURE AND SOFTWARE
DHARMAR P. AGRAWAL, ed. 30 Aug. 1986 421 p Workshop

held in Charleston, S.C., 5-7 May 1986; sponsored by ARO, Research Triangle Park, N.C. Prepared for Battelle Columbus Labs., Ohio

(Contract DAAG29-81-D-0100)
(AD-A184949) Avail: NTIS HC A18/MF A01 CSCL 09B

Topics discussed include instruction set considerations, custom chips, memory hierarchy and parallel architecture, interconnection and reconfiguration strategies, granularity issues, mapping algorithms and task assignment, reusable and retargetable software, distributed operating systems, concurrency control, MIMO parallelism and support, distributed computing systems, architecture and software issues, logic and functional programming, VLSI and related issues, and applicative language and data flow techniques.

N88-20210# Office of Technology Assessment, Washington, DC.

DEFENDING SECRETS, SHARING DATA: NEW LOCKS AND KEYS FOR ELECTRONIC INFORMATION

Oct. 1987 191 p
(PB88-143185; OTA-CIT-310) Avail: NTIS HC A09/MF A01; also available SOD HC \$8.50 as 052-000-010-83-6 CSCL 05B

Federal policies directed at protecting information, particularly in electronics communications systems are examined. Also examined are the vulnerability of communications and computer systems, and the trends in technology for safeguarding information in these systems. The primary activities and motivations of stakeholders such as banks, government agencies, vendors and standards developers to generate and use safeguards are reviewed. The focus is on issues stemming from possible conflicts among Federal policy goals and important trends taking place in the private sector are addressed. GRA

N88-20212# National Technical Information Service, Springfield, VA.

DIRECTORY OF JAPANESE TECHNICAL RESOURCES, 1987

1988 128 p
(PB87-205258; ISBN-0-934213-07-0) Avail: NTIS HC A07/MF
A01 CSCL 05B

In order to provide a context for understanding how to use Japanese technical literature, the directory is supplemented with important background material. The directories, which comprise the major section of this publication, are divided into four parts. The first contains an alphabetical list of commercial services that collect, abstract, translate, or disseminate Japanese technical literature. Following this are two indices, one by area of specialization and one by state. The second lists government agencies with programs and services involving Japanese technical information. The third contains libraries in both the public and private sectors that have extensive holding of Japanese technical literature. The final part lists Japanese technical documents translated at Federal expense which are available to the public. B.G.

N88-20214# Defense Technical Information Center, Alexandria, VA. Office of Information Systems and Technology.

A DIRECTORY OF DATABASES AVAILABLE THROUGH SEARCHMAESTRO

Oct. 1987 300 p
(AD-A188813) Avail: NTIS HC A13/MF A01 CSCL 05B

SearchMAESTRO is Menu-Aided Easy Searching Through Relative Options. It is a knowledge gateway service set up for the Department of Defense by the Defense Technical Information Center. The MAESTRO gives DOD Endusers an easy-to-use way to access over 900 databases without needing to know how to search in any of them. This Directory of Databases is divided into two lists: (1) databases by subject, (2) alphabetically. The database vendors accessible; are: ADP Network Services, BRS, Data-Star, Datasolve Limited, DataTimes, DIALOG, G. Cam Serveur, News Net, Pergamon ORBIT Infoline, Telesystems/Questel, VU/TEXT, and H.W. Wilson. GRA

N88-20825# Carlow Associates, Inc., Fairfax, VA.
ADVANCED HUMAN FACTORS ENGINEERING TOOL TECHNOLOGIES Final Report, 18 Jul. 1986 - 2 Apr. 1987
 STEPHEN A. FLEGER, KATHRYN E. PERMENTER, and THOMAS B. MALONE 20 Mar. 1987 276 p
 (Contract DAAA15-86-C-0064)
 (AD-A189390) Avail: NTIS HC A13/MF A01 CSCL 23B

Presented are the results of a study to identify the human factors engineering (HFE) technologies or tools presently used, and projected for use, by HFE specialists. Both traditional and advanced tools were candidates for inclusion in the report, although the emphasis of the study was on advanced computer applications. Human factors practitioners representing the government, the military, academe and private industry were surveyed to identify those tools most frequently used or viewed as most important for conducting human factors engineering related work. If advanced tool capabilities did not meet existing job requirements, the specialists identified the types of tools they would like to see developed to fill the existing technology gaps. The advanced tools were categorized using an eight point classification scheme, which included the phase(s) of the material acquisition process in which the tools' application would be most appropriate. All of the tools were ranked to facilitate tool selection, and entered into a database to accommodate future revisions. The survey resulted in the identification of 113 advanced human factors engineering tools.

GRA

N88-21697*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

LABORATORY INFORMATION MANAGEMENT SYSTEM (LIMS): A CASE STUDY

KAREN S. CRANDALL, JUDITH V. AUPING, and ROBERT G. MEGARGLE (Cleveland State Univ., Ohio.) 1987 18 p Presented at the 1st International Laboratory Information Management Systems Meeting, Pittsburgh, Pa., 23-25 Jan. 1987
 (NASA-TM-100835; E-4024; NAS 1.15:100835) Avail: NTIS HC A03/MF A01 CSCL 09B

In the late 70's, a refurbishment of the analytical laboratories serving the Materials Division at NASA Lewis Research Center was undertaken. As part of the modernization efforts, a Laboratory Information Management System (LIMS) was to be included. Preliminary studies indicated a custom-designed system as the best choice in order to satisfy all of the requirements. A scaled down version of the original design has been in operation since 1984. The LIMS, a combination of computer hardware, provides the chemical characterization laboratory with an information data base, a report generator, a user interface, and networking capabilities. This paper is an account of the processes involved in designing and implementing that LIMS.

Author

N88-22542# Los Alamos National Lab., NM.
MONITORING THE USAGE OF A COMPUTER SYSTEM

D. J. BAILEY Nov. 1987 14 p Presented at the IEEE Symposium on Security and Privacy, Oakland, Calif., 1 Apr. 1988
 (Contract W-7405-ENG-36)
 (DE88-004310; LA-UR-87-4103; CONF-880456-1) Avail: NTIS HC A03/MF A01

Controlling the usage of computer systems particularly those operated for the Federal government, is an important topic today. Audit requirements have grown to the point where they can be a significant burden to the proprietors of the system. The paper briefly mentions several proposals for responding to increased audit requirements and for monitoring a system to detect unauthorized activity. A technique is proposed for situations where the proscribed or the intended activity can be characterized in terms of program or system performance parameters. The design of a usage monitoring system is outlined. The design is based on enhancing the audit data provided by the monitored system, capturing the audit data in a separate system to protect it from user access, and implementing one of the audit trail analysis systems currently under development.

DOE

N88-23446*# District of Columbia Univ., Washington, DC. Dept. of Computer Science.

DATA MANAGEMENT AND LANGUAGE ENHANCEMENT FOR GENERALIZED SET THEORY COMPUTER LANGUAGE FOR OPERATION OF LARGE RELATIONAL DATABASES Final Report

GAIL T. FINLEY 25 May 1988 48 p

(Contract NAG5-91)

(NASA-CR-182868; NAS 1.26:182868) Avail: NTIS HC A03/MF A01 CSCL 09B

This report covers the study of the relational database implementation in the NASCAD computer program system. The existing system is used primarily for computer aided design. Attention is also directed to a hidden-surface algorithm for final drawing output.

Author

N88-23686 Naval Ocean Systems Center, San Diego, CA. Special Libraries Association.

TRANSLATIONS OF SCIENTIFIC AND TECHNICAL LITERATURE: A GUIDE TO THEIR LOCATION

KATHLEEN WRIGHT 1987 32 p

Avail: Issuing Activity

The purpose of this guide is to assist searchers in the location of English language translations of foreign scientific and technical literature. Strategies for locating an existing translation are given along with guidance for users who do not have access to the major bibliographic tools. Major providers of existing translations are described, and procedures for having a publication translated by a commercial firm or a government agency are suggested.

Author

N88-23812*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

ENVIRONET: AN INTERACTIVE SPACE-ENVIRONMENT INFORMATION RESOURCE

ALFRED L. VAMPOLA, WILLIAM N. HALL (Air Force Geophysics Lab., Hanscom AFB, Mass.), and MICHAEL LAURIENTE 24 May 1988 13 p Prepared for Air Force Space Div., Los Angeles, Calif.

(Contract F04701-85-C-0086-P00019)

(NASA-TM-101137; TR-0088(3671-01)-1; NAS 1.15:101137; SD-TR-88-60; AD-A197556) Avail: NTIS HC A03/MF A01 CSCL 22A

EnviroNET is an interactive menu-driven system set up as an information resource for experimenters, program managers, and design and test engineers involved in space missions. Its basic use is as a fundamental single source of data for the environment encountered by Shuttle and Space Station payloads, but it also has wider applicability in that it includes information on environments encountered by other satellites in both low altitude and high altitude (including geosynchronous) orbits. It incorporates both a text-retrieval mode and an interactive modeling code mode. The system is maintained on the ENVET MicroVAX computer at NASA/Goddard Space Flight Center. Its services are available at no cost to any user who has access to a terminal and modem. It is a tail-node on SPAN, and so it is accessible either directly or through BITNET, ARPANET, and GTE/TELENET via NPSS.

Author

N88-24150*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

IMAGE MANAGEMENT RESEARCH

ANDREW B. WATSON *In its* Space Station Human Factors Research Review. Volume 4: Inhouse Advanced Development and Research p 23-28 May 1988

Avail: NTIS HC A07/MF A01 CSCL 05H

Two types of research issues are involved in image management systems with space station applications: image processing research and image perception research. The image processing issues are the traditional ones of digitizing, coding, compressing, storing, analyzing, and displaying, but with a new emphasis on the constraints imposed by the human perceiver. Two image coding algorithms have been developed that may increase the efficiency

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of image management systems (IMS). Image perception research involves a study of the theoretical and practical aspects of visual perception of electronically displayed images. Issues include how rapidly a user can search through a library of images, how to make this search more efficient, and how to present images in terms of resolution and split screens. Other issues include optimal interface to an IMS and how to code images in a way that is optimal for the human perceiver. A test-bed within which such issues can be addressed has been designed. J.P.B.

N88-24179# Royal Signals and Radar Establishment, Malvern (England).

DEVELOPMENT ENVIRONMENT FOR SECURE SOFTWARE

C. T. SENNETT Nov. 1987 22 p
(RSRE-87015; BR104812; ETN-88-92512; AD-A191889) Avail: NTIS HC A03/MF A01

Criteria to which a development environment should conform to be suitable for the production of secure software are given. A rationale for the criteria and a suitable security policy model for software development are outlined. ESA

N88-24200*# Maryland Univ., College Park.

MODELS AND METRICS FOR SOFTWARE MANAGEMENT AND ENGINEERING

V. R. BASILI 1988 12 p
(Contract NSG-5123)
(NASA-CR-182953; NAS 1.26:182953) Avail: NTIS HC A03/MF A01 CSCL 09B

This paper attempts to characterize and present a state of the art view of several quantitative models and metrics of the software life cycle. These models and metrics can be used to aid in managing and engineering software projects. They deal with various aspects of the software process and product, including resources allocation and estimation, changes and errors, size, complexity and reliability. Some indication is given of the extent to which the various models have been used and the success they have achieved. Author

N88-25163# Transportation Systems Center, Cambridge, MA.
COMPUTER RESOURCE MANAGEMENT TECHNOLOGY PROGRAM (PE 64740F). TASK NO. 9: ADVANCED USER AUTHENTICATION Final Report, May - Nov. 1987

L. WATSON and W. BARRON Mar. 1988 125 p Sponsored by the Air Force, Hanscom AFB, Mass.
(PB88-183066; DOT-TSC-RSPA-88-1; DOT-VA846-88-1) Avail: NTIS HC A06/MF A01 CSCL 09B

The various technologies which can be used to perform user authentication are examined with an emphasis on biometric techniques. The methods by which each device performs the authentication of users are examined individually, and their suitability for a multilevel computer environment is assessed. The status and direction of computer user authentication devices and techniques, in general, are evaluated. Included are independent testing results, government requirements, selection considerations, and a glossary of computer security and user authentication terminology. Author

N88-25176# Rensselaer Polytechnic Inst., Troy, NY. Dept. of Computer Science.

BEYOND ADA: GENERATING ADA CODE FROM EQUATIONAL SPECIFICATIONS

BOLESŁAW K. SZYMANSKI 1987 6 p
(Contract N00014-86-K-0442)
(AD-A191866) Avail: NTIS HC A02/MF A01 CSCL 12E

Real time mission-oriented embedded systems are much more difficult to design than ordinary software systems. They require highly reliable and efficient implementations to satisfy mission and time constraints imposed by the applications. The Ada language has been design to facilitate real time system software development. However, for many programmers the size and complexity of Ada itself are of concern. In the assertive programming paradigm, computations are specified as sets of assertions about properties of the solution, and not as a sequence of procedural steps. Solving procedures are automatically

generated from the assertive description. Real time programming for mission-oriented systems is supported by equational languages in which assertions are expressed as algebraic equations. Programs written in equational languages are concise, free from implementation details, and easily amenable to verification and parallel processing. The level of programming expertise required to program in an equational language is much lower than the level that is needed by Ada programmers. The paper describes an implementation of an equational language system which generates highly efficient distributed code in Ada. It also demonstrates how the equational language system can be used in real time software development. GRA

N88-25188# Los Alamos National Lab., NM.

THE -MDOC MACRO PACKAGE: A SOFTWARE TOOL TO SUPPORT COMPUTER DOCUMENTATION STANDARDS

C. E. SANDERS 16 Sep. 1987 13 p Presented at the 35th Annual International Technical Communication Conference, Philadelphia, Pa., 10 May 1988
(Contract W-7405-ENG-36)
(DE88-000500; LA-UR-87-3129; CONF-880528-1) Avail: NTIS HC A03/MF A01

At Los Alamos National Laboratory a small staff of writers and word processors in the Computer Documentation Group is responsible for producing computer documentation for the over 8000 users of the laboratory's computer network. The -mdoc macro package was developed as a software tool to support that effort. The -mdoc macro package is used with the NROFF/TROFF document preparation system on the UNIX operating system. The -mdoc macro package incorporates the standards for computer documentation at Los Alamos established by the writers. Use of the -mdoc macro package has freed the staff of programming format details, allowing writers to concentrate on content of documents and word processors to produce documents in a timely manner. It is an easy-to-use software tool that adapts to changing skills, needs, and technology. DOE

N88-26107# Lawrence Livermore National Lab., CA.
ADVANCES IN PERSONAL COMPUTERS FOR SCIENTIFIC APPLICATIONS

D. E. CULLEN Apr. 1988 12 p Presented at the International Centre for Physics Workshop on Applied Nuclear Theory and Nuclear Model Calculations for Nuclear Technology Application, Trieste, Italy, 5 Mar. 1988
(Contract W-7405-ENG-48)
(DE88-009824; UCRL-98555; CONF-880342-2; CONF-880342) Avail: NTIS HC A03/MF A01

Over just the last few years the power (in terms of speed and core size) of personal computers has grown at an incredible rate, which no one could have foreseen, and at the present time they have reached the point where it is practical to use personal computers for large scientific applications. What is truly amazing is that as the power of these personal computers has grown the price has remained relatively low. Of equal importance to the availability and cost of personal computers is the availability of computer software for use on these computers. At the current time personal computers have excellent FORTRAN compilers and related supporting software facilities and more and more application programs are being converted for use on personal computers. Today we have reached the point where the combination of personal computer power and low cost can allow even small institutes that cannot afford larger computers to have significant computer resources available for their use. DOE

N88-26266# Oak Ridge National Lab., TN.

A COMPARATIVE STUDY OF PROJECT ESTIMATING TOOLS

K. A. JONES, A. R. SADLOWE, M. L. EMRICH, L. F. ARROWOOD, B. D. WATSON, and R. SURAPANENI 1987 25 p Presented at the NARDAC Washington/ORNLD/DSRD Conference on Expert Systems Technology in the ADP Environment, Washington, D.C., 2 Nov. 1987
(Contract DE-AC05-84OR-21400)
(DE88-009059; CONF-871128-2) Avail: NTIS HC A03/MF A01

Existing project estimation software may adequately estimate programming costs associated with large software development projects. However, customizing these packages to reflect unique organizational requirements may be difficult. In addition, such systems may not offer justifications for indicated costs and personnel levels. A knowledge-based system, ADP-Estimator, is being developed to estimate project resources and costs. Such knowledge-based software can retain estimating expertise and make it available to other personnel. DOE

N88-26805# Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Psychology.

THE ROLE OF WORKING MEMORY IN LANGUAGE COMPREHENSION

PATRICIA A. CARPENTER and MARCEL A. JUST Feb. 1988 33 p

(Contract N00014-85-K-0584; RR0-4206)

(AD-A192721; ONR-88-1) Avail: NTIS HC A03/MF A01 CSCL 05H

This chapter provides an account of the transient computational and storage demands that typically arise during comprehension, and of the information management policies that attempt to satisfy those demands. The chapter describes a number of recent studies that examine the trading relation between computation and storage in working memory during language comprehension. Comprehension processes tend to minimize storage requirements by minimizing the number of partial products that have to be stored. The minimization is accomplished by immediately digesting as much of the information from the text as possible (what we have called the immediacy of processing), rather than using a wait-and-see strategy. A second focus is on the differences among individuals in their ability to maintain information in working memory during comprehension. Such individual differences in working memory capacity are closely related to large and stable individual differences in reading comprehension ability. GRA

N88-26817# Institute for Water Resources, Fort Belvoir, VA. **MANAGING MICROCOMPUTER APPLICATIONS: A PRIMER AND GUIDE TO GOOD PRACTICE**

RICHARD M. MALES and MICHAEL R. WALSH Mar. 1988 92 p (AD-A192992; IWR-88-R-3) Avail: NTIS HC A05/MF A01 CSCL 12F

This report has a dual purpose. First, the report is a primer for managers to help them understand the potential impacts of the microcomputer on organization and staff productivity. The most common types of microcomputer software are described and basic types of applications developed by planners are discussed. Second, the report is a guide for managers faced with managing the use of microcomputers and the development of applications by their staff and others. A process for managing the development of corporate applications is presented. The report is directed at a non-computer professional audience, i.e. managers within the Corps who have a technical background, but may not be microcomputer users themselves, and have as part of their responsibility the management of individuals and/or projects in which microcomputers are used. The report is designed primarily to raise awareness of the need for, and the methods of, management of microcomputer applications. Outline formats are often used, and key ideas are highlighted. It is hoped that this format will communicate the key concepts better than a more traditional report. GRA

N88-26837# Air Command and Staff Coll., Maxwell AFB, AL. **COMPUTER-AIDED WRITING**

DAVID A. KING Apr. 1988 81 p (AD-A192516; ACSC-88-1465) Avail: NTIS HC A05/MF A01 CSCL 05F

The production of written communications is an important and time-consuming activity for most professional organizations. Computer-aided writing offers great potential for increased productivity, quality, and convenience. In addition to word processors, Computer-Aided Writing (CAW) tools include outline

processors and prompting programs, electronic dictionaries, style and grammar checkers, logic analyzers, on-line information systems for research, disk-based references, commenting and review software, desktop publishing and typesetting systems, and hypertext systems. The purpose of this research report is to survey the field of Computer-Aided Writing (CAW) tools for use on IBM-compatible Personal Computer (PC) systems. The information presented in this report is intended to acquaint computer resource managers and prospective CAW users with current PC-based CAW technology. Based on an extensive review of recent PC literature and hands-on evaluation of selected CAW products, this report discusses various categories of CAW tools, utility of current products, prospects for future developments, and selection and planning criteria. The report also specifically addresses the application of CAW technology at the Air Command and Staff College (ACSC) which is the sponsor of this project. GRA

N88-27109# National Bureau of Standards, Gaithersburg, MD. Information Systems Engineering Div.

COMPUTER SCIENCE AND TECHNOLOGY: KNOWLEDGE-BASED SYSTEM FOR PHYSICAL DATABASE DESIGN Final Report

C. E. DABROWSKI and D. K. JEFFERSON Feb. 1988 62 p (PB88-193289; NBS/SP-500/151) Avail: NTIS HC A04/MF A01; also available SOD HC \$3.25 as 003-003-02849-5 CSCL 05B

A knowledge-based system for physical database design has been developed at the Institute for Computer Sciences and Technology. The system processes large multi-entity databases with complex workload requirements and identifies near-optimal physical designs. It employs heuristics developed by physical design experts and cost modeling algorithms to reduce the large number of design alternatives available in large complex problems to a few select designs. The system is implemented in LISP. GRA

N88-27116# Oak Ridge National Lab., TN.

KNOWLEDGE-BASED COST ESTIMATING VS TRADITIONAL SOFTWARE COST MODELS

L. F. ARROWOOD, M. L. EMRICH, A. R. SADLOWE, K. A. JONES, B. D. WATSON, and R. SURAPANENI 12 Apr. 1988 25 p Presented at the 2nd Annual Engineering Society of Detroit SMI Expert Systems 88 Solutions in Manufacturing Conference and Exhibition, Detroit, Mich., 12 Apr. 1988

(Contract DE-AC05-84OR-21400)

(DE88-009707; CONF-8804115-1) Avail: NTIS HC A03/MF A01

A knowledge-based system, ADP-Estimator, is under development to perform ADP project cost estimating. Designed to retain crucial expertise held by experienced project leaders, this system allows new project leaders to interactively generate cost estimates. Initially, project leaders indicate constraints (e.g. personnel levels, equipment, and facilities) placed upon a project. The system uses these to identify resources and procedures required for project completion. The efficacy of this system is compared with manual efforts and traditional software cost models. DOE

N88-27767# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

INSPECTION METHODS IN PROGRAMMING: CLICHES AND PLANS

CHARLES RICH Dec. 1987 94 p (Contract N00014-85-K-0124; NSF IRI-86-16644) (AD-A192782; AI-M-1005) Avail: NTIS HC A05/MF A01 CSCL 12E

Inspection methods are a kind of engineering problem solving based on the recognition and use of standard forms or cliches. Examples are given of program analysis, program synthesis and program validation by inspection. A formalism, called the Plan Calculus, is defined and used to represent programming cliches in a convenient, canonical, and programming-language independent fashion. GRA

05 COMPUTERS AND INFORMATION MANAGEMENT

N88-27969# Air Command and Staff Coll., Maxwell AFB, AL.
**USE OF OPTICAL DISK TECHNOLOGY AT THE AIR
COMMAND AND STAFF COLLEGE**
CURTIS H. ARRINGTON, III Apr. 1988 30 p
(AD-A192424; ACSC-88-0130) Avail: NTIS HC A03/MF A01
CSCL 12F

Optical disk technology, the use of lasers to store and retrieve information, is a growing technology for use in audio, video, computer storage and multi-media applications. This technology has a great potential in educational applications. After reviewing the history of information capture and storage, this paper examines how optical disk technology works, its capabilities and limitations. The paper reviews current and potential educational applications, and matches ACSC technology requirements against the potential of optical disk. The paper concludes that optical disk is a viable technology to meet several ACSC requirements and recommends the acquisition of optical disk systems for use in specific applications. GRA

N88-28637# Air Command and Staff Coll., Maxwell AFB, AL.
WHAT'S ON THE MENU? FRIENDLIER COMPUTERS
CARL A. BASIL Apr. 1988 30 p
(AD-A194393; ACSC-88-0235) Avail: NTIS HC A03/MF A01
CSCL 12E

The paper focuses on how to tap the true power, flexibility, and potential of personal computers by making these easier to use. It is a starting point from which computer users can begin to make computers do what they want, when they want, and in a manner they choose. The study includes an evaluation of computer-user interface programs as an alternative solution to learning computer languages and other technical features not directly associated with using computers to accomplish specific tasks. The study concludes that menuing programs are the most powerful interfaces available and offer users ease-of-use and greater productivity. GRA

N88-28643# Dayton Univ., OH. Research Inst.
**RESEARCH ON WIDE AREA WORKSTATIONS Final Report,
Jul. 1985 - Jul. 1986**

JAMES T. KAJIYA Mar. 1988 40 p Prepared in cooperation with California Institute of Technology, Pasadena, Calif.
(Contract F30602-81-C-0206)
(AD-A192529; RAD-TR-87-226) Avail: NTIS HC A03/MF A01
CSCL 17E

The use of dynamic random access memory (DRAM) for storing large digital images in a workstation environment was studied. The need and advantages of a workstation with access to a digital image stored in semiconductor memory are discussed. Algorithms that take advantage of the wide image area for image warping, correlation, panning, roaming, and zooming are shown. GRA

N88-28680# Sanders Associates, Inc., Nashua, NH.
**ARTIFICIAL INTELLIGENCE SOFTWARE ACQUISITION
PROGRAM, VOLUME 2 Final Technical Report, Aug. 1985 -
Aug. 1987**
CAROL BARDAWIL, LARRY FRY, SANDY KING, LINDA
LESZCZYNSKI, and GRAHAM ONEIL Dec. 1987 83 p
(Contract F30602-85-C-0254)
(AD-A194239; RAD-TR-87-249-VOL-2) Avail: NTIS HC
A05/MF A01 CSCL 12E

This research evaluated the software development process for artificial intelligence (AI) systems and postulates a software acquisition model. The major elements performed were a literature search, a case study analysis of 26 knowledge based system (KBS) development efforts, and consultation with experienced AI system developers. This volume discusses a KBS process model and customer/developer interface model. A comparison of the postulated model with DOD-STD-2167 and DOD-STD-2167A (draft) is made in terms of activities, products, reviews and baselines. GRA

N88-29382*# General Dynamics Corp., San Diego, CA. Data Systems Div.

**ARCHETYPING: A SOFTWARE GENERATION AND
MANAGEMENT METHODOLOGY**

HUGH B. ROTHMAN and STANLEY M. PRZYBYLINSKI /n NASA,
Marshall Space Flight Center, Second Conference on Artificial
Intelligence for Space Applications p 293-302 Aug. 1988
Avail: NTIS HC A99/MF E03 CSCL 09B

Many knowledge based software generation methods have been proposed to improve software quality and programmer productivity. Several government and industry initiatives have focused on software reusability as one solution to these problems. DARTS (trademark), a General Dynamics proprietary symbolic processing technology, provides a unique solution to the reuse problem: archtyping. Archtyping is the embedding of high order language statements in text files. An advanced macroprocessor uses the text files to generate new versions of complex software systems. A DARTS program, the Software Generation and Configuration Management (SGCM) System automates the archtyping process and maintenance cycle. The DARTS technology is briefly discussed, archtyping is described, and the SGCM system is presented in detail. Author

N88-29385*# Martin Marietta Aerospace, Denver, CO. Space Station Program.

**INTELLIGENT RESOURCE MANAGEMENT FOR LOCAL AREA
NETWORKS: APPROACH AND EVOLUTION**

ROGER MEIKE /n NASA, Marshall Space Flight Center, Second
Conference on Artificial Intelligence for Space Applications p
319-324 Aug. 1988
Avail: NTIS HC A99/MF E03 CSCL 09B

The Data Management System network is a complex and important part of manned space platforms. Its efficient operation is vital to crew, subsystems and experiments. AI is being considered to aid in the initial design of the network and to augment the management of its operation. The Intelligent Resource Management for Local Area Networks (IRMA-LAN) project is concerned with the application of AI techniques to network configuration and management. A network simulation was constructed employing real time process scheduling for realistic loads, and utilizing the IEEE 802.4 token passing scheme. This simulation is an integral part of the construction of the IRMA-LAN system. From it, a causal model is being constructed for use in prediction and deep reasoning about the system configuration. An AI network design advisor is being added to help in the design of an efficient network. The AI portion of the system is planned to evolve into a dynamic network management aid. The approach, the integrated simulation, project evolution, and some initial results are described. Author

N88-29431*# Draper (Charles Stark) Lab., Inc., Cambridge, MA.
ADVANCED INFORMATION PROCESSING SYSTEM:

INPUT/OUTPUT NETWORK MANAGEMENT SOFTWARE

GAIL NAGLE, LINDA ALGER, and ALEXANDER KEMP May
1988 288 p
(Contract NAS1-17666)
(NASA-CR-181678; NAS 1.26:181678) Avail: NTIS HC A13/MF
A01 CSCL 09B

The purpose of this document is to provide the software requirements and specifications for the Input/Output Network Management Services for the Advanced Information Processing System. This introduction and overview section is provided to briefly outline the overall architecture and software requirements of the AIPS system before discussing the details of the design requirements and specifications of the AIPS I/O Network Management software. A brief overview of the AIPS architecture followed by a more detailed description of the network architecture. Author

N88-29635 Rensselaer Polytechnic Inst., Troy, NY.
**TECHNICAL COMMUNICATION IN THE COMPUTER
INDUSTRY: AN INFORMATION-DEVELOPMENT PROCESS TO**

TRACK, MEASURE AND ENSURE QUALITY Ph.D. Thesis

ROGER ALAN GRICE 1987 438 p

Avail: Univ. Microfilms Order No. DA8803441

The needs of the information society have thrust into prominence those who produce the technical information needed to work with computers. As a consequence of the need for technical information, those who develop and produce that information are called upon to translate the technical capabilities of complex computer systems into a form that enables readers to perform needed tasks. Since the information produced is an integral part of the product, it follows that the information developers must work as an integral part of the product-development team, not as post-facto wordsmiths who clean up the writing done by product developers. To function in this capacity, they need an information-development process that is consistent with the product-development process. Developing information in this environment is not simply following a set of rules for communicating correctly, but is a process for converting detailed technical information into information that enables users of high-technology products to do the tasks they want or need to do; it is not merely describing the structure of those products and the functions that are available. While the process is well defined in many of its aspects, it also possesses many implications for further research and development efforts by academic researchers and industrial practitioners alike.

Dissert. Abstr.

N88-30355*# LNK Corp., Riverdale, MD.**A DESIGN FOR A GROUND-BASED DATA MANAGEMENT SYSTEM**

BARBARA A. LAMBERT and DAVID LAVINE *In* NASA, Goddard Space Flight Center, The 1988 Goddard Conference on Space Applications of Artificial Intelligence p 355-369 Aug. 1988

Avail: NTIS HC A19/MF A01 CSDL 05B

An initial design for a ground-based data management system which includes intelligent data abstraction and cataloging is described. The large quantity of data on some current and future NASA missions leads to significant problems in providing scientists with quick access to relevant data. Human screening of data for potential relevance to a particular study is time-consuming and costly. Intelligent databases can provide automatic screening when given relevant scientific parameters and constraints. The data management system would provide, at a minimum, information of availability of the range of data, the type available, specific time periods covered together with data quality information, and related sources of data. The system would inform the user about the primary types of screening, analysis, and methods of presentation available to the user. The system would then aid the user with performing the desired tasks, in such a way that the user need only specify the scientific parameters and objectives, and not worry about specific details for running a particular program. The design contains modules for data abstraction, catalog plan abstraction, a user-friendly interface, and expert systems for data handling, data evaluation, and application analysis. The emphasis is on developing general facilities for data representation, description, analysis, and presentation that will be easily used by scientists directly, thus bypassing the knowledge acquisition bottleneck. Expert system technology is used for many different aspects of the data management system, including the direct user interface, the interface to the data analysis routines, and the analysis of instrument status.

Author

N88-30453*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.**PUBLICATIONS OF THE JET PROPULSION LABORATORY 1987**

15 Aug. 1988 32 p

(NASA-CR-181198; JPL-BIBL-39-29; NAS 1.26:181198) Avail: NTIS HC A03/MF A01 CSDL 05B

A bibliography is presented which describes and indexes by author the externally distributed technical reporting, released during the calendar year 1987, that resulted from scientific and engineering work performed, or managed, by the Jet Propulsion Lab. Three classes of publications are included: (1) JPL publications in which

the information is complete for a specific accomplishment; (2) Articles from the quarterly Telecommunications and Data Acquisition Progress Report; and (3) Articles published in the open literature.

E.R.

N88-30459# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France).**LINGUISTIC AND CULTURAL BARRIERS TO THE TRANSFER OF INFORMATION**

ROLAND LARUE *In* AGARD, Barriers to Information Transfer and Approaches Toward Their Reduction 7 p Mar. 1988

Avail: NTIS HC A06/MF A01

The relative importance of languages in the world in 1987 is described showing that the world population makes use of about ten languages, each of which covers an area of the globe. The trends are revealed by an analysis of population density and socio-economic balances. The use of language is studied in the field of science and technology, according to the type of communication (written or spoken) and the contents (from mathematics to technology) and the tendencies are shown. The attempts which were made to overcome the linguistic barrier - such as the introduction of a single common language (esperanto or English) or the development of the study of foreign languages are examined. The detailed analysis of the cultural barrier is carried out by several approaches (sociological, psychosociological, psychoanalytic, and psycholinguistic) in order to reveal the genuine individual and collective stakes. Future trends, such as the working of the Commission of the European Communities with its nine official languages are discussed, and some predictions are put forward on the linguistic state of the world at the beginning of the 21st century.

Author

N88-30463# Atlantic Refining Co., Philadelphia, PA. ARCOvision Services.**INFORMATION TECHNOLOGY TO FACILITATE GROUP INTERACTION**

CYNTHIA A. SAVAGE *In* AGARD, Barriers to Information Transfer and Approaches Toward Their Reduction 3 p Mar. 1988

Avail: NTIS HC A06/MF A01

Atlantic Richfield has successfully operated an interactive, full-motion video teleconferencing system since September of 1983. The system, named ARCOvision, is for internal use only and consists of six locations in the United States including Alaska. The implementation, capabilities, equipment, and costs related to the ARCOvision system will be discussed.

Author

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RESEARCH AND DEVELOPMENT

Includes Contracts and Contract Management, Project Management, Program Management, Research Projects and Research Facilities, Scientific Research, Innovations and Inventions, Technology Transfer and Utilization, R & D Resources, Agency, National and International R & D.

A88-12428*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.**SPACELAB LIFE SCIENCES 1 AND 2 SCIENTIFIC RESEARCH OBJECTIVES**

CAROLYN S. LEACH and HOWARD J. SCHNEIDER (NASA, Johnson Space Center, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 8th, Tokyo, Japan, Nov. 4-8, 1986) Physiologist, Supplement (ISSN 0031-9376), vol. 30, Feb. 1987, p. S-6 to S-9. refs

The pressurized Spacelab module was designed and built to allow investigators to conduct research in space in an environment approximating that of a ground-based laboratory. It is configured to allow multiple investigations employing both human and

nonhuman subjects. This flexibility is exemplified by the SLS-1, SLS-2, and SLS-3 experiment complement. A total of 21 experiments are scheduled for these missions; the areas to be investigated are renal/endocrine function, cardiovascular/cardiopulmonary function, hematology, immunology, metabolic activity of muscle, Ca metabolism, the vestibular system, and general biology. A plan for integration of measurements will allow each investigator to use data from other experiments. The experiments make up a scientifically balanced payload that addresses fundamental biomedical problems associated with space flight and provides the first opportunity to study the acute effects of weightlessness in a comprehensive, interrelated fashion.

Author

A88-13974

LOOKING TO YEAR 2001

MICHAEL WILHITE Spaceflight (ISSN 0038-6340), vol. 29, Oct. 1987, p. 48-53.

The space programs of different countries are reviewed and ongoing developments in launch vehicle capability and manned space operations are identified. The primary feature of the new Soviet rocket Energia is its role as the booster for the Soviet Space Shuttle which is expected to lift up to 66,000 pounds of cargo. A small spaceplane has been developed which will replace the Soyuz-TM spacecraft in 1991 as a crew and limited-cargo transport to Mir. Space policy in the U.S. is discussed as well as the International Space Station, the return of expendable launchers, the evolution of Ariane, a European manned program, Japan's manned space goals, and India's domestic programs.

K.K.

A88-14364* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SHUTTLE II

T. A. TALAY (NASA, Langley Research Center, Hampton, VA) SAE, Aerospace Vehicle Conference, Washington, DC, June 8-10, 1987. 10 p. NASA-supported research. refs (SAE PAPER 871335)

This paper presents a status report on the study of a next-generation manned launch system, called Shuttle II, being conducted at the NASA Langley Research Center. Underlying reasons for considering such a system include the need for low-cost, safe, and reliable manned access to space. System and operational characteristics for a Shuttle II vehicle are presented. The need for fully reusable launch systems with radically simpler ground and flight operations is stated to be critical in reducing launch costs. Advancing technologies have a major impact on the choice of vehicle concepts. For a near-term level of technology, a two-stage vertical-takeoff rocket vehicle has been selected for further in-depth Shuttle II studies. The role of the Shuttle II vehicle in a proposed space transportation system, which includes heavy lift and Space Shuttle complementary manned systems, is discussed.

Author

A88-15833*# National Aeronautics and Space Administration, Washington, DC.

TECHNOLOGY - THE BASIS FOR THE PAST, THE KEY TO THE FUTURE

LEONARD A. HARRIS and RAYMOND S. COLLADAY (NASA, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. (IAF PAPER 87-47)

The relationship between new technology and space missions, and the objectives of the Civil Space Technology Initiative (CSTI) are studied. The CSTI is concerned with technologies for safe and efficient access to space, earth-orbiting operations, and future science missions. The initiative focuses on research in the areas of propulsion, vehicles, information systems, large space structures and their control, power, and automation and robotics. Consideration is given to the development of high-performance engines for next-generation vehicles, booster technology for hybrid and pressure-fed propulsion systems, and a space OTV based on the aerobrake concept. Research involved with the application of automation and robotics to earth-orbiting operations are discussed.

The control of flexible structure flight experiment, the use of nuclear systems for space propulsion, and the development of sensor devices and high-rate, high-capacity data systems are examined.

I.F.

A88-15912*# National Aeronautics and Space Administration. Earth Resources Lab., Bay St. Louis, MS.

NASA'S EARTH RESOURCES LABORATORY - SEVENTEEN YEARS OF USING REMOTELY SENSED SATELLITE DATA IN LAND APPLICATIONS

KENNETH D. CASHION and CHARLES A. WHITEHURST (NASA, Earth Resources Laboratory, Bay Saint Louis, MS) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 8 p. (IAF PAPER 87-164)

The activities of the Earth Resources Laboratory (ERL) for the past seventeen years are reviewed with particular reference to four typical applications demonstrating the use of remotely sensed data in a geobased information system context. The applications discussed are: a fire control model for the Olympic National Park; wildlife habitat modeling; a resource inventory system including a potential soil erosion model; and a corridor analysis model for locating routes between geographical locations. Some future applications are also discussed.

V.L.

A88-16246#

TOWARDS AN INTERNATIONAL LUNAR BASE

H. H. KOELLE (Berlin, Technische Universitaet, Federal Republic of Germany) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 11 p. refs (IAF PAPER 87-673)

It appears very likely that early next century a lunar base will be established to explore and utilize the resources of the moon. This paper offers first a set of objectives which can be used for comparing alternative plans for such an international lunar base. Also the effects of lunar base size on its cost-effectiveness is shown. Furthermore the architecture of a lunar base is described. The major thrust of the paper is the presentation of a scenario which might lead to an international lunar base. The subjects discussed are: program scope and structure, program organization, program financing and ways and means of initiating such a program. The program presented envisions the establishment of a lunar orbiting Space Station by no later than the year 2001 and the construction of an initial lunar laboratory by no later than the year 2010 to be followed by a lunar factory. A 'Lunar Development Conference' is suggested to take place in 1989 where interested national governments and parties should discuss the objectives, structure, scope, schedule and organizational alternatives of an international lunar base.

Author

A88-16376

AEROSPACEPLANE - NASA'S FLAME REKINDLED

JULIAN MOXON Flight International (ISSN 0015-3710), vol. 132, Oct. 10, 1987, p. 31, 32.

The NASA/USAF joint National Aerospaceplane ('NASP') program has as its goal the creation of a Mach 25-capable, SSTO vehicle that will also be able to sustain endoatmospheric hypersonic cruise for passenger-carrying and reconnaissance missions. The testing of the integration of numerous state-of-the-art technologies involved in NASP has generated the further requirement for the creation of the X-30 test vehicle. Attention is presently given to the programmatic consequentiality of the development of an operational scramjet powerplant that can achieve sustained operation in the X-30.

O.C.

A88-17024

COMMUNICATIONS SATELLITES: THE TECHNOLOGY OF SPACE COMMUNICATIONS

LARRY BLONSTEIN New York, John Wiley and Sons, Inc., 1987, 175 p. refs

An introduction to communications satellites is presented. The topics addressed include: getting a satellite into orbit; the geosynchronous orbit; transfer of a satellite from low orbit to

geosynchronous altitude; disturbances in orbit; the operational requirements, including station-keeping, pointing, electrical power, and thermal control; the on-board communications equipment; and the allocation of radio frequencies and wavelengths. Also discussed are: coverage, gain, and EIRP; earth stations; traffic capacity and quality; satellite selection; economic system optimization; encryption; the economics of satellite communications; and future trends. C.D.

A88-17039

EARTH SCIENCE MISSIONS FOR THE SPACE STATION

WILLIAM D. CARTER (Globex, Inc., Reston, VA) (COSPAR, International Union of Geological Sciences, UN, et al., Plenary Meeting, 26th, Workshop X and Topical Meeting on Remote Sensing: Earth's Surface and Atmosphere, Toulouse, France, June 30-July 11, 1986) *Advances in Space Research* (ISSN 0273-1177), vol. 7, no. 3, 1987, p. 101-106. refs

Beginning as early as 1994, the NASA Space Station will be operational in low equatorial orbit. It is presently recommended that the Station incorporate as part of its instrument suite a multispectral synthetic aperture imaging radar, which would be primarily used to map cloud-covered regions of the globe, and an imaging spectrometer, which would be similar to the Shuttle Multispectral IR Radiometer. The radar would give emphasis to the study of such transient phenomena as ocean surface roughness and wind shear effects during hurricanes and typhoons; the radiometer would have a 50-km swath width, and 128 bands from 0.4 to 2.5 microns. O.C.

A88-17314

NEW DIRECTIONS FOR SPACE ASTRONOMY

ROBERT A. BROWN and RICCARDO GIACCONI (Space Telescope Science Institute, Baltimore, MD) *Science* (ISSN 0036-8075), vol. 238, Oct. 30, 1987, p. 617-619. refs

The foundations of the current space-based astronomy program are reviewed, and the risks associated with the Space Shuttle are described along with the opportunities missed through the adoption of the Shuttle program. The level of support that the Space Shuttle can extend to the space astronomy program is examined. An alternative space astronomy program for the 1990s based on unmanned missions is suggested. C.D.

A88-17333#

AUTONOMOUS NAVIGATION - WHEN WILL WE HAVE IT?

ALFRED J. TREDER (Boeing Aerospace Co., Space Navigation Technology Div., Seattle, WA) IN: Institute of Navigation, National Technical Meeting, Anaheim, CA, Jan. 20-23, 1987, Proceedings. Washington, DC, Institute of Navigation, 1987, p. 96-105. Research sponsored by the Boeing Aerospace Co. refs

Autonomous navigation capability has been defined as that additional capability designed into a spacecraft which allows it to perform on-board task execution (with decision making) without intervention or control from the ground. In the present paper, the utility of autonomous navigation for spacecraft operations is examined to define the related critical issues confronting a spacecraft designer. Relative navigation to other spacecraft, especially to GPS, is shown to be the most cost-effective near-term means of approaching the goals of autonomous navigation without necessarily achieving real autonomy. B.J.

A88-17933

THE USE OF PHOTOGRAPHIC INSTRUMENTATION AND MOTION PICTURE PHOTOGRAPHY IN NASA SPACE PROGRAMS

LINCOLN L. ENDELMAN IN: International Congress on High Speed Photography and Photonics, 17th, Pretoria, Republic of South Africa, Sept. 1-5, 1986, Proceedings. Volume 2. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1986, p. 507-520. refs

A comprehensive account is made of the photographic image acquisition, processing, and interpretation resources developed and currently employed by NASA. Photographic planning for such manned missions as those of the Space Shuttle requires 18-24

months from inception to implementation and must be informed by such considerations as the rationing of volume on the Shuttle Orbiter and the severity of the environment that will be encountered during EVA photographic sessions. Attention is given to the special films, camera filters, and camera optics employed by NASA. O.C.

A88-18223

JAPAN - FUTURE SPACE SAMURAI?

CHRIS BULLOCH *Space Markets* (ISSN 0258-4212), Fall 1987, 1987, p. 117-130.

The prospects for Japan's role in space are assessed. The administrative structure of the Japanese space program is described, and the autonomous state it will attain with the H-II launcher scheduled to fly in 1992 is addressed. Japanese space research projects are examined, including those based on the Spaceplane. The Japanese role in the International Space Station is discussed, and Japanese activities in satellite-based telecommunications and broadcasting are examined. O.C.

A88-18226

ADVANCED COMPOSITES: THE LATEST DEVELOPMENTS; PROCEEDINGS OF THE SECOND CONFERENCE, DEARBORN, MI, NOV. 18-20, 1986

Conference sponsored by ASM International, Engineering Society of Detroit, SAMPE, et al. Metals Park, OH, ASM International, 1986, 322 p. For individual items see A88-18227 to A88-18246.

The present conference on state-of-the-art composites discusses safety factors in composite automobile design, diesel engine pistons with ceramic fiber reinforcement, novel methods in filament winding, flat thermoplastic tape-laying, the damage tolerance of three-dimensionally braided carbon/PEEK composites, stacked composite springs, and thermoplastic vs. thermoset process economics. Also discussed are the fluid mechanics of mold-filling, toughening mechanisms for polymer-matrix composites, SMC surface characterization for adhesion, seam bonding in CRP, high-speed thermoplastic compression molding, long fiber-reinforced thermoplastic composites, metal matrix composites' use as a Be substitute, stress concentration in composite structures, and new applications for dielectric monitoring and control. O.C.

A88-18495#

DIAMONDS SHINE BRIGHTLY IN AEROSPACE'S FUTURE

ALAN S. BROWN *Aerospace America* (ISSN 0740-722X), vol. 25, Nov. 1987, p. 12-15, 37.

CVD processes have been developed for the deposition of continuous diamond films under carefully controlled conditions that permit a tailoring of resulting characteristics. Generally, CVD diamond films are strong, stiff, hard, and slippery; they can transmit light from the FIR through the UV, and are five times more thermally conductive than copper. Diamond semiconductors will be able to operate at much higher electrical power levels than competing materials. The hardness of these films, together with their high transparency, encourages their use as protective coatings for delicate optical device windows. Comparisons are made between true diamond film properties and those of CVD diamondlike coatings, which are amorphous. O.C.

A88-21077* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

ACCOMMODATING LIFE SCIENCES ON THE SPACE STATION

ROGER D. ARNO (NASA, Ames Research Center, Moffett Field, CA) SAE, Intersociety Conference on Environmental Systems, 17th, Seattle, WA, July 13-15, 1987. 8 p. refs (SAE PAPER 871412)

The NASA Ames Research Center Biological Research Project (BRP) is responsible for identifying and accommodating high priority life science activities, utilizing nonhuman specimens, on the Space Station and is charged to bridge the gap between the science community and the Space Station Program. This paper discusses the approaches taken by the BRP in accommodating these research objectives to constraints imposed by the Space Station System, while maintaining a user-friendly environment. Consideration is

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given to the particular research disciplines which are given priority, the science objectives in each of these disciplines, the functions and activities required by these objectives, the research equipment, and the equipment suits. Life sciences programs planned by the Space Station participating partners (USA, Europe, Japan, and Canada) are compared. I.S.

A88-21099* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

TECHNOLOGY BASE FOR MICROGRAVITY HORTICULTURE

R. L. SAUER (NASA, Johnson Space Center, Houston, TX), J. W. MAGNUSON, R. R. SCRUBY, and H. W. SCHELD (PhytoResource Research, Inc., College Station, TX) SAE, Intersociety Conference on Environmental Systems, 17th, Seattle, WA, July 13-15, 1987. 10 p. refs

(Contract NAS9-16671)

(SAE PAPER 871436)

Advanced microgravity plant biology research and life support system development for the spacecraft environment are critically hampered by the lack of a technology base. This inadequacy stems primarily from the fact that microgravity results in a lack of convective currents and phase separation as compared to the one gravity environment. A program plan is being initiated to develop this technology base. This program will provide an iterative flight development effort that will be closely integrated with both basic science investigations and advanced life support system development efforts incorporating biological processes. The critical considerations include optimum illumination methods, root aeration, root and shoot support, and heat rejection and gas exchange in the plant canopy. Author

A88-21122* Management and Technical Services Co., Houston, TX.

LIFE SCIENCES BIOMEDICAL RESEARCH PLANNING FOR SPACE STATION

GARY R. PRIMEAUX (RCA Government Services; Management and Technical Services Co., Houston, TX), ROGER MICHAUD, LADONNA MILLER, JIM SEARCY, and BERNISTINE DICKEY (NASA, Johnson Space Center, Houston, TX) SAE, Intersociety Conference on Environmental Systems, 17th, Seattle, WA, July 13-15, 1987. 9 p. refs

(SAE PAPER 871464)

The Biomedical Research Project (BmRP), a major component of the NASA Life Sciences Space Station Program, incorporates a laboratory for the study of the effects of microgravity on the human body, and the development of techniques capable of modifying or counteracting these effects. Attention is presently given to a representative scenario of BmRP investigations and associated engineering analyses, together with an account of the evolutionary process by which the scenarios and the Space Station design requirements they entail are identified. Attention is given to a tether-implemented 'variable gravity centrifuge'. O.C.

A88-21124* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

BIOTECHNOLOGY OPPORTUNITIES ON SPACE STATION

JESS DEMING, KEITH HENDERSON, ROBERT W. PHILLIPS (NASA, Johnson Space Center, Houston, TX), BERNISTINE DICKEY, PHYLLIS GROUNDS (RCA Government Services; Management and Technical Services Co., Houston, TX) et al. SAE, Intersociety Conference on Environmental Systems, 17th, Seattle, WA, July 13-15, 1987. 7 p.

(SAE PAPER 871468)

Biotechnology applications which could be implemented on the Space Station are examined. The advances possible in biotechnology due to the favorable microgravity environment are discussed. The objectives of the Space Station Life Sciences Program are: (1) the study of human diseases, (2) biopolymer processing, and (3) the development of cryoprocessing and cryopreservation methods. The use of the microgravity environment for crystal growth, cell culturing, and the separation of biological materials is considered. The proposed Space Station research

could provide benefits to the fields of medicine, pharmaceuticals, genetics, agriculture, and industrial waste management. I.F.

A88-21156* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

STATUS OF THE SPACE STATION WATER RECLAMATION AND MANAGEMENT SUBSYSTEM DESIGN CONCEPT

R. M. BAGDIGIAN and P. L. MORTAZAVI (NASA, Marshall Space Flight Center, Huntsville, AL) SAE, Intersociety Conference on Environmental Systems, 17th, Seattle, WA, July 13-15, 1987. 11 p. refs

(SAE PAPER 871510)

A development status report is presented for the NASA Space Station's water reclamation and management (WRM) system, for which the candidate phase change-employing processing technologies are an air evaporation subsystem, a thermoelectric integrated membrane evaporation subsystem, and the vapor compression distillation subsystem. These WRM candidates employ evaporation to effect water removal from contaminants, but differ in their control of the vapor/liquid interface in zero-gravity and in the recovery of the latent heat of vaporization. O.C.

A88-21570

SCIENTIFIC OBJECTIVES AND FUNCTIONAL REQUIREMENTS OF LIFE SCIENCES IN THE SPACE STATION

FLEMMING BONDE-PETERSEN (Rigshospitalet, Copenhagen, Denmark) (Columbus II; Proceedings of the Second Workshop, Hanover, Federal Republic of Germany, June 9-11, 1986) Space Technology - Industrial and Commercial Applications (ISSN 0277-4488), vol. 7, no. 1-2, 1987, p. 157-160.

The types of biomedical experiments planned for the International Space Station are listed and briefly characterized, indicating the operational capabilities and equipment they require. Primary objectives include descriptive and applied human physiology and medicine, animal physiology, plant physiology, cellular physiology, radiation biology and exobiology, and bioprocessing. Consideration is given to the relatively noncritical microgravity specifications for life-science experiments (typically 0.001 g or less), the crew-intervention requirements, the arrangement of experimental equipment in the Pressurized Module, and the integration of a large centrifuge module in the core Space Station. T.K.

A88-22000

PROCEEDINGS OF THE FOURTH ANNUAL L5 SPACE DEVELOPMENT CONFERENCE

FRANK HECKER, ED. (L-5 Society, Tucson, AZ) San Diego, CA (Science and Technology Series. Volume 68), Univelt, Inc., 1987, 268 p. No individual items are abstracted in this volume.

Scientific, technological, and political aspects of present and planned U.S. space activities are discussed in reviews and reports. Topics addressed include space and U.S. politics, space resources, international space ventures, space-age education, and space biomedicine. Consideration is given to communities in space, space tourism, the 'pure' space sciences, and the cultural drive for space. Diagrams, drawings, graphs, photographs, and tables of numerical data are provided. T.K.

A88-22145*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

ATMOSPHERIC SCIENCES PROGRAM AT NASA KENNEDY SPACE CENTER

JAMES R. NICHOLSON and WILLIAM JAFFERIS (NASA, Kennedy Space Center, Cocoa Beach, FL) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 4 p.

(AIAA PAPER 88-0197)

A very keen awareness of the impact of lightning threat on ground operations exists at NASA Kennedy Space Center (KSC) because of the high frequency of thunderstorm occurrences in Florida. The majority of thunder events occur in the summertime, initiated by solar heating of the land. Merritt Island, where KSC is located, produces its own thunderstorms under light flow conditions; because some are small, their importance might be unappreciated

at first glance. The impress of these facts, and others of pertinence, on the KSC atmospheric sciences development program will be discussed, priorities enumerated, and a review of development projects presented. Author

A88-22172*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AN HISTORICAL PERSPECTIVE ON HYPERSONIC AERODYNAMIC RESEARCH AT THE LANGLEY RESEARCH CENTER

PATRICK J. JOHNSTON and WALLACE C. SAWYER (NASA, Langley Research Center, Hampton, VA) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 14 p. refs (AIAA PAPER 88-0230)

The 40-year history of hypersonic technology is reviewed from a technical perspective. A broad overview is first given of the major accomplishments of hypersonic flight projects and systems studies that have been conducted over the last 40-odd years. Then, the history of major supersonic and hypersonic ground facilities at the NASA Langley and Ames Research Centers is traced, and some of the research conducted in them over the past 40 years is reviewed. C.D.

A88-22286#

LARGE SPACE SYSTEMS ENVIRONMENTAL ENTANGLEMENTS

CARL J. FRUSHON and JOHN A. GAUDET (USAF, Geophysics Laboratory, Bedford, MA) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 27 p. refs (AIAA PAPER 88-0388)

The most important adverse environmental impacts on future space systems are identified and discussed. Charging, radiation, contamination, atomic oxygen erosion, particle impacts, high-voltage interactions, and thermal forces are considered. Research on ways to mitigate these forces and counteract their adverse impacts is addressed. C.D.

A88-24809

METEORITES AND THEIR PARENT PLANETS

HARRY Y. MCSWEEN, JR. (Tennessee, University, Knoxville) Cambridge and New York, Cambridge University Press, 1987, 249 p. refs

This book explores the origins of meteorites by tracing them back to their parent bodies, which are the sites of various geological processes. Recent discoveries are reviewed which reveal that the chemical and physical properties of meteorites contain a record of the processes that formed the solar system. How meteorites escape their parent bodies and find their way to earth is explained. C.D.

A88-24814

SUPERALLOYS II

CHESTER T. SIMS, ED., NORMAN S. STOLOFF, ED. (Rensselaer Polytechnic Institute, Troy, NY), and WILLIAM C. HAGEL, ED. (Arbormet, Ltd., Ann Arbor, MI) New York, Wiley-Interscience, 1987, 635 p. No individual items are abstracted in this volume.

Superalloys are those alloys based on Group VIIIa-base elements developed for elevated temperature service in virtue of their combination of mechanical strength with surface stability in such corrosive environments as those of aircraft and industrial gas turbines, coal conversion plants, etc. An updated account is presently given of the genesis and character of superalloys; superalloys' impact on gas turbine design; precipitation- and dispersion-strengthening, and precipitation-hardening; representative Ni-, Co-, and Ni-Fe-base alloys; directionally solidified superalloys; phase composition prediction, mechanical behavior, and fatigue; high temperature oxidation, hot corrosion, and protective coatings; investment-cast, wrought, and P/M alloys; and prospective competition for superalloys from nonmetallic materials. O.C.

A88-24820

STATIC AND DYNAMIC PHOTOELASTICITY AND CAUSTICS RECENT DEVELOPMENTS

A. LAGARDE, ED. (Poitiers, Universite, France) Vienna and New York, Springer-Verlag (International Centre for Mechanical Sciences, CISM Courses and Lectures, No. 290), 1987, 528 p. No individual items are abstracted in this volume.

The fundamental principles and applications of photoelastic analysis and NDE are examined in chapters contributed by leading experts. Topics addressed include integrated photoelasticity; coherent-light photoelastic NDE with applications to two-dimensional and three-dimensional problems in statics, contact stresses, fracture mechanics, and dynamic impulse; dynamic photoelasticity and its application to stress-wave propagation, fracture mechanics, and fracture control; and the shadow-optics method of caustics. Diagrams, drawings, graphs, and sample images are provided. T.K.

A88-24978#

CANADIAN DIRECTIONS IN SPACE SCIENCE - AN UPDATE

A. L. VANKOUGHNETT and D. J. W. KENDALL (National Research Council of Canada, Space Div., Ottawa) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 33, Dec. 1987, p. 205-210. refs

An evaluation is made of current Canadian commitments and future prospects in space science, under the aegis of the National Research Council of Canada. Efforts are underway in magnetospheric and plasma physics, upper atmospheric chemistry and physics, space astronomy, and both biological and materials-oriented microgravity sciences. These efforts all involve collaboration with either ESA, NASA, Japan, or the USSR. Attention is given to the Canadian contribution to such projects as the Viking spacecraft Imager, the suprathermal ion mass spectrometer for EXOS-D, the Interball Imager, and the wind-imaging interferometer for the Upper Atmosphere Research Satellite. O.C.

A88-27750*# National Aeronautics and Space Administration, Washington, DC.

IN-SPACE RESEARCH, TECHNOLOGY AND ENGINEERING EXPERIMENTS AND SPACE STATION

RICHARD TYSON (NASA, Office of Aeronautics and Space Technology, Washington, DC) and CHARLES F. GARTRELL (General Research Corp., McLean, VA) AIAA, Meeting on Space Station Utilization, 1st, Arlington, VA, Mar. 7-9, 1988, Paper. 18 p. refs

The NASA Space Station will serve as a technology research laboratory, a payload-servicing facility, and a large structure fabrication and assembly facility. Space structures research will encompass advanced structural concepts and their dynamics, advanced control concepts, sensors, and actuators. Experiments dealing with fluid management will gather data on such fundamentals as multiphase flow phenomena. As requirements for power systems and thermal management grow, experiments quantifying the performance of energy systems and thermal management concepts will be undertaken, together with expanded efforts in the fields of information systems, automation, and robotics. O.C.

A88-27833

PROPOSED USES OF ERS-1

G. DUCHOSSOIS and J.-P. GUIGNARD (ESA, Paris, France) (COSPAR, WMO, URSI, et al., Plenary Meeting, 26th, Symposium 3, Workshop V, and Topical Meeting A2 on Remote Sensing from Space, Toulouse, France, June 30-July 11, 1986) Advances in Space Research (ISSN 0273-1177), vol. 7, no. 11, 1987, p. 293-298.

The first European Remote Sensing Satellite (ERS-1) is one of the major programs of the European Space Agency (ESA) in the field of earth observation. It is due to be launched in December 1989 and will embark a very comprehensive set of radar instruments designed to observe the surface wind and wave structure over the oceans and to provide high resolution all-weather images of

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the ice caps, coastal zones and land surface. The paper briefly describes the main features and expected geophysical performances of these various instruments; it provides examples for the utilization of ERS-1 data for scientific research in such fields as physical oceanography, glaciology and climatology, as well as in application demonstrations for offshore activities and land resources management. Author

A88-28538

CHOOSING PARTNERS FOR A MANNED MISSION TO MARS

MICHAEL A. G. MICHAUD (U.S. Department of State, Washington, DC) Space Policy (ISSN 0265-9646), vol. 4, Feb. 1988, p. 12-18. refs

Proposals for cooperation with the USSR in space are discussed. It is shown that any U.S. administration will remain sensitive to the transfer of technologies central to the achievement of a Mars mission (such as propulsion, sensors, computers, and communication) which can be used for military purposes. Experience suggests that making a Mars mission dependent on U.S.-Soviet cooperation may delay its realization. A complementary model is outlined in which technologies are developed separately, and the exchange of information concerns mission plans, scientific data, mutual support on the Martian surface, and rescue capability. It is concluded that a cooperative Mars-rover and surface-sample-return effort could provide a useful precedent for complementary manned Mars missions. A.S.

A88-28551

MATERIALS PROCESSING IN THE REDUCED GRAVITY ENVIRONMENT OF SPACE; PROCEEDINGS OF THE SYMPOSIUM, BOSTON, MA, DEC. 1-3, 1986

ROBERT H. DOREMUS, ED. (Rensselaer Polytechnic Institute, Troy, NY) and PAUL C. NORDINE, ED. (Midwest Research Institute, Kansas City, MO) Symposium sponsored by the Materials Research Society. Pittsburgh, PA, Materials Research Society (Materials Research Society Symposia Proceedings. Volume 87), 1987, 377 p. For individual items see A88-28552 to A88-28588.

The present conference on microgravity materials processing discusses gravitational effects in CVD, containerless processing of undercooled melts, isothermal dendritic growth, fluid mechanics and materials science experiments using acoustic levitation, the influence of thermal gravitational convection on solidification processes, applications of charged drop levitators, floating-zone processing of In in earth orbit, and the free-fall behavior of liquid-metal drops in a gaseous atmosphere. Also discussed are ultrafine particle and fiber production in microgravity, monodisperse latex particles produced in space, evaporation kinetics in the hanging drop method of protein crystal growth, phase separation kinetics in immiscible liquids, glass formation in microgravity, and containerless metal evaporation by laser-induced fluorescence. O.C.

A88-28951

UNIVERSE (2ND EDITION)

WILLIAM J. KAUFMANN, III (San Diego State University, CA) New York, W. H. Freeman and Co., 1988, 654 p. refs

A general text on astronomy is presented. The foundations of the science are reviewed, including descriptions of naked-eye observations of eclipses and planetary motions and such basic tools as Kepler's laws, the fundamental properties of light, and the optics of telescopes. The formation of the solar system is addressed, and the planets and their satellites are discussed individually. Solar science is treated in detail. Stellar evolution is described chronologically from birth to death. Molecular clouds, star clusters, nebulae, neutron stars, black holes, and various other phenomena that occur in the life of a star are examined in the sequence in which they naturally occur. A survey of the Milky Way introduces galactic astronomy. Quasars and cosmology are addressed, including the most recent developments in research. C.D.

A88-29103

BIOLOGICAL SCIENCES IN SPACE 1986; PROCEEDINGS OF THE 1986 INTERNATIONAL SYMPOSIUM, NAGOYA, JAPAN, NOV. 10-12, 1986

SATORU WATANABE, ED., SHIGEO MORI, ED. (Nagoya University, Japan), and GENYO MITARAI, ED. (Chukyo University, Toyota, Japan) Symposium sponsored by MOESC, Natural Space Development Agency of Japan, Japan Society of Microgravity Application, et al. Tokyo, MYU Research (International Symposium Series, No. 2), 1987, 392 p. For individual items see A88-29104 to A88-29148.

This book includes topics in space physiology and medicine, space biology and CELSS (Controlled Ecological Life Support System), space radiology, and space biotechnology. Papers are presented on the role of preventive medicine in the future of USA space life sciences and the status of space life sciences in Japan. Consideration is given to sympathetic nervous responses in man to weightlessness simulated by head-out water immersion, the effect of centrifugal force on the gain and phase of the canal-ocular reflex in rabbit, DNA damage and mutation induced by health lamp-light (UVB) in *E. coli*, Azolla and other small vascular floating plants as a functioning agent of nitrogen fixation in CELSS, the interaction of cosmic radiation and microgravity in the development processes of *Carausius morosus*, and the electrofusion of plant protoplasts under microgravity conditions. I.S.

A88-29104

THE ROLE OF PREVENTIVE MEDICINE IN THE FUTURE OF USA SPACE LIFE SCIENCES

JAMES M. VANDERPLOEG (Keisey-Seybold Clinic, Houston, TX) IN: Biological sciences in space 1986; Proceedings of the 1986 International Symposium, Nagoya, Japan, Nov. 10-12, 1986. Tokyo, MYU Research, 1987, p. 1-8. refs

The preventive, diagnostic, and treatment capabilities of the Health Maintenance Facility (HMF) which will fly aboard the Space Station are discussed. The preventive aspects of the HMF will include facilities for fitness-maintenance exercises and for the periodic collection and evaluation of physiological data which will be used to detect early changes in physiological parameters and to institute corrective measures if needed. This data base will also help to determine the natural history of physiologic changes in space and to define the physiologic norms for microgravity. The diagnostic capabilities, which will include cardiorespiratory assessment, clinical laboratory analyses, and imaging system, will enable the crew members to detect and diagnose medical problems inflight and to initiate remedial action immediately. The treatment capabilities will include a life support module, an anesthesia and minor surgery work station, intravenous fluid generation and therapy, a hyperbaric treatment facility, and a pharmacy. I.S.

A88-29105

MAN IN SPACE: 25 YEARS OF MANNED SPACE FLIGHTS IN THE SOVIET UNION - BIOMEDICAL ASPECTS

ANATOLII I. GRIGOR'EV and INESSA B. KOZLOVSKAIA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IN: Biological sciences in space 1986; Proceedings of the 1986 International Symposium, Nagoya, Japan, Nov. 10-12, 1986. Tokyo, MYU Research, 1987, p. 9-16.

Primary weightlessness-induced physiological disorders that appear soon after exposure to the conditions of space flight are identified, and measures used to maintain good health condition and high work capacity of crewmembers during prolonged space flights are discussed. Among these measures are taking countermeasures against specific symptoms and providing adequate and comfortable environment, rational work and rest cycle, sufficiently long sleep, and well balanced nutrition. Of great importance is also the proper selection of individual crew members and the proper balance of crews, as well as their physical, professional, and medical training. I.S.

A88-29106**THE SPACE LIFE SCIENCES RESEARCH AND APPLICATION IN EUROPE**

KARL E. KLEIN (DFVLR, Institut fuer Flugmedizin, Cologne, Federal Republic of Germany) IN: Biological sciences in space 1986; Proceedings of the 1986 International Symposium, Nagoya, Japan, Nov. 10-12, 1986. Tokyo, MYU Research, 1987, p. 17-24.

The space life sciences activities planned and implemented by ESA and by various West-European national space organizations focus on three domains: (1) the utilization of the space environment for basic research in space life sciences (LSs), (2) the development of technologies for the maintenance of physical and mental health of man in space, and (3) the utilization of microgravity for a potential commercial application. The past projects with European LS payloads on the USSR and the U.S. missions are discussed along with the LS payloads of future missions planned and the specific research activities to be carried out on these flights. I.S.

A88-29107**SPACE LIFE SCIENCES IN JAPAN**

GENYO MITARAI (Chukyo University, Toyota, Japan) IN: Biological sciences in space 1986; Proceedings of the 1986 International Symposium, Nagoya, Japan, Nov. 10-12, 1986. Tokyo, MYU Research, 1987, p. 25-37. refs

Space life sciences (LSs) research activity of Japan is reviewed, and the present status of the twelve LS experiments planned for the First Materials Processing Test planned to be conducted aboard the Space Station is discussed. The experiments planned for the FMPT projects include studies on endocrine and metabolic changes and on visual stability in space, a neurophysiological study of posture control in fish, studies of the effect of microgravity on the development and formation of bone tissue, and studies on the genetic effects of HZE and cosmic radiation. Other experiments will include investigations on crystal growth in zero gravity, ultrastructural changes of cells in culture, the circadian rhythm of fungus, the electrophoretic separation of cells, and the efficiency of protein electrophoresis in zero gravity. I.S.

A88-29195**LONG-TERM STRATEGY OF SPACE SCIENCE IN JAPAN**

M. ODA (Tokyo, University, Japan) (COSPAR, IAU, IUGS, et al., Plenary Meeting, 26th, Topical Meeting C3, Workshop III, and Symposium 8 on Planetary Studies, Toulouse, France, June 30-July 11, 1986) Advances in Space Research (ISSN 0273-1177), vol. 7, no. 12, 1987, p. 171-174.

The scientific satellites of Japan which have been launched since 1970 and are scheduled for launch in the 1990s are discussed with respect to their characteristics, mission goals, and the highlights of the observations obtained by past missions. The strategy so far was to place emphasis on the frequency of the programs rather than on the scale of the mission. Future model missions for astronomy/astrophysics and solar systems science are discussed. The astronomy/astrophysics missions to be launched in the 1990s and the early 2000s will include four X-ray observatories, two IR missions, two solar physics observatories, and one each of gamma-ray, space VLBI, and UV missions. Mission models for solar systems science include satellites for investigating Venusian atmosphere, Jovian magnetosphere, solar wind, and the geomagnetic field. In preparation for planetary science in the 21st century, a lunar mission is planned for the mid 1990s. I.S.

A88-29196* Los Alamos National Lab., NM.**A LUNAR LABORATORY**

P. W. KEATON (Los Alamos National Laboratory, NM) and M. B. DUKE (NASA, Johnson Space Center, Houston, TX) (COSPAR, IAU, IUGS, et al., Plenary Meeting, 26th, Topical Meeting C3, Workshop III, and Symposium 8 on Planetary Studies, Toulouse, France, June 30-July 11, 1986) Advances in Space Research (ISSN 0273-1177), vol. 7, no. 12, 1987, p. 175-183. Previously announced in STAR as N87-12580. refs

An international research laboratory can be established on the Moon in the early years of the 21st Century. It can be built using the transportation system now envisioned by NASA, which includes

a space station for Earth orbital logistics and orbital transfer vehicles for Earth-Moon transportation. A scientific laboratory on the Moon would permit extended surface and subsurface geological exploration; long-duration experiments defining the lunar environment and its modification by surface activity; new classes of observations in astronomy; space plasma and fundamental physics experiments; and lunar resource development. The discovery of a lunar source for propellants may reduce the cost of constructing large permanent facilities in space and enhance other space programs such as Mars exploration. D.E.

A88-29197**THE PHOBOS MISSION - SCIENTIFIC GOALS**

R. Z. SAGDEEV, V. M. BALEBANOV, A. V. ZAKHAROV, V. M. KOVTUNENKO, R. S. KREMNEV (AN SSSR, Institut Kosmicheskikh Issledovaniy, Moscow, USSR) et al. (COSPAR, IAU, IUGS, et al., Plenary Meeting, 26th, Topical Meeting C3, Workshop III, and Symposium 8 on Planetary Studies, Toulouse, France, June 30-July 11, 1986) Advances in Space Research (ISSN 0273-1177), vol. 7, no. 12, 1987, p. 185-200.

The objectives of the USSR Phobos mission, which include studies of the Martian satellites Phobos and Deimos, the atmospheric phenomena of Mars, and physical processes occurring on the sun and in the interplanetary space medium, are described. The Phobos spacecraft will carry scientific payload for 22 experiments. Two descenders, each with its own scientific instruments, will be jettisoned for landing on Phobos's surface for a thorough study of this satellite. The participants of the Phobos project include agencies, scientists, and specialists from Austria, Bulgaria, Czechoslovakia, ESA, Finland, France, the GDR, Hungary, the FRG, Poland, the Soviet Union, Switzerland, and Sweden. Diagrams of experiments' schematics and the spacecraft trajectories are included. I.S.

A88-29226* National Aeronautics and Space Administration, Washington, DC.**SPACE SCIENCE AT NASA - RETROSPECT AND PROSPECT**

JEFFREY D. ROSENTHAL (NASA, Office of Space Science and Applications, Washington, DC) British Interplanetary Society, Journal (NASA Space Science) (ISSN 0007-084X), vol. 41, Jan.-Feb. 1988, p. 3-9. refs

Following a brief overview of past accomplishments in space science, a status report is given concerning progress toward recovering from the Challenger accident and a number of trends are described which are likely to have a major influence on the future of the NASA Space Science program. Key changes in process include a trend toward a program centered on the use of large, long-lived facilities, the emergence of strong space capabilities outside the U.S., and steps being taken toward the diversification of NASA's launch capability. A number of recent planning activities are also discussed. Major considerations which will specifically need to be taken into account in NASA's program planning include the need for provision of a spectrum of flight activities and the need to recognize likely resource limitations and to do more realistic program planning. Author

A88-29230**THE PROMISE OF THE HUBBLE SPACE TELESCOPE**

C. R. O'DELL (Rice University, Houston, TX) British Interplanetary Society, Journal (NASA Space Science) (ISSN 0007-084X), vol. 41, Jan.-Feb. 1988, p. 35-40. refs

Aspects of the Hubble Space Telescope (HST) are discussed. The background of the HST program is reviewed, and the characteristics of the observatory are discussed. The status of the hardware and the method of operations are addressed, and the maintenance and refurbishment are considered. The possibilities opened by the HST are examined. C.D.

A88-29231**THE EXPLORATION OF THE SOLAR SYSTEM**

DAVID MORRISON (Hawaii, University, Honolulu) British Interplanetary Society, Journal (NASA Space Science) (ISSN 0007-084X), vol. 41, Jan.-Feb. 1988, p. 41-47.

06 RESEARCH AND DEVELOPMENT

Accomplishments in the study of the solar system over the past two decades are reviewed. The findings that have been made in missions to the moon, inner planets, outer planets and their satellites, and the solar system's primitive bodies are discussed. Future planetary missions are briefly addressed. C.D.

A88-29237

SPACE FARMING IN THE 21ST CENTURY

FRANK B. SALISBURY and BRUCE G. BUGBEE (Utah State University, Logan) Twenty-first Century Science and Technology (ISSN 0895-6820), vol. 1, Mar.-Apr. 1988, p. 32-41. refs

An account is given of the system design features and projected productivity of a fusion-powered farm on the moon, dubbed 'Luna City'. Attention is given to the rationale for nuclear fusion power and to the nutritional and cultural criteria applied to crop evaluation, as well as to plant physiological responses to the entirely artificial environment, and the cuisine that could be based on the crops in question. Legumes, salad crops, leaf and flower crops, sugar-precursors, nuts, roots and tubers, grains, fruits, oil-bearing crops, and herbs and spices, are all included in the plan for Luna City. O.C.

A88-29768#

SOVIET SPACE PHYSIOLOGY FROM ITS ORIGINS TO THE 'CLOSE LOOK'

CATHLEEN LEWIS (Smithsonian Institution, Washington, DC) Society for the History of Technology, Pittsburgh, PA, Oct. 24, 1986, Paper. 17 p. refs

Research areas covered by space physiology experiments conducted in the USSR since 1948 are overviewed together with the sources of Soviet information on space physiology that exist for U.S. scientists. It is emphasized that information sources stemming from international scientific contact, in form of meetings or personal contacts of scientists, and, in particular, in form of joint experiments, present the most reliable and relevant sources of information. Two major bilateral exchanges between the two countries in the past have been the exchange of data on space physiology during the meetings of the Joint Working Group of Space Biology and Medicine, during which the representatives of the Soviet Institute for Biomedical Problems and of NASA's Life Sciences Division have exchanged data on the Soyuz-Salyut project, and the joint Apollo-Soyuz Test Project, which afforded the U.S. scientists a rare close look at the Soviet instruments used in space. I.S.

A88-30168

BORN AGAIN

RALPH D. LORENZ Spaceflight (ISSN 0038-6340), vol. 30, March 1988, p. 93-95.

Examples of the reutilization of spacecraft and space hardware in other applications, some far removed from that originally intended, are described. The reutilization of spacecraft and components associated with comet exploration in other cometary missions, both past missions and planned missions, is addressed. Proposals to sharing items between Space Shuttle missions and using Space Shuttle external tanks for unrelated purposes, such as a container for enclosing the gamma ray telescope, are described. C.D.

A88-30400

GOING TO MARS BY WAY OF THE MOON - THE ROLE OF A LUNAR BASE IN MARS EXPLORATION

MICHAEL B. DUKE Planetary Report (ISSN 0736-3680), vol. 8, Mar.-Apr. 1988, p. 4-7.

Lunar mission experience derived from the Apollo program allows confident planning to be undertaken in the near term with a view to the establishment of a lunar base around the turn of the century. Attention is presently given to major aspects of such an undertaking that directly bear on the comparative risks of a manned mission to Mars. These involve experience-accumulation in LEO for the longer Mars mission, the development of mining technologies and closed cycle life-support systems required for

operations independent of terrestrial supplies, and testbed experimentation for human survival in microgravity environments.

O.C.

A88-31187

CIVIL AIR TRANSPORTS FOR THE 21ST CENTURY - A EUROPEAN VIEW

DENIS LITTLE (Airbus Industrie, Blagnac, France) ICAO Bulletin (ISSN 0018-8778), vol. 43, Feb. 1988, p. 9-13.

A comprehensive view is presented of the next-generation development plans of Airbus Industrie. Near-term technology growth will extend to the incorporation of computer-driven fly-by-wire controls, wingtip fences, and horizontal tailplane trim-tanks on A300 and A310 variants. Farther afield, CRT cockpit displays and sidestick controllers will be applied to the all-new, 150-seat A320 flight deck. The next-generation four-engine A340 and twin-engine A330 will involve an extremely high level of commonality in basic fuselage, wing, cockpit, empennage, and systems. O.C.

A88-32827#

SOCIAL PSYCHOLOGICAL RESEARCH IN NASA - HISTORY, STATUS, PROSPECTS

ROBERT L. HELMREICH (Texas, University, Austin) American Psychological Association, Annual Convention, 94th, Washington, DC, Aug. 22-26, 1986, Paper. 5 p. refs

The history of psychological research in NASA is reviewed with consideration given to changes and new roles for psychology. With a view to establishing a permanent presence in space in the form of the Space Station, consideration is currently being given to a plan for research in aviation and space psychology. Multiple methodologies and research settings would be utilized, ranging from the laboratory to the simulator to the undersea habitat and to the simultaneous examination of behavior at the organizational, group, and individual level. K.K.

A88-33442

ADVANCED SPACE PROPULSION TECHNOLOGY FOR SPACE LEADERSHIP

STEPHEN A. EVANS, ALAN DARBY, and KEITH N. WATTS (Rockwell International Corp., Rocketdyne Div., Canoga Park, CA) IN: EASCON '87; Proceedings of the Twentieth Annual Electronics and Aerospace Systems Conference, Washington, DC, Oct. 14-16, 1987. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 135-141.

The application of a water electrolysis system as a propulsion system for the Space Station is discussed. The advantages of water in space operations are indicated, and a block diagram of the propulsion system is shown. The application of this propulsion system to other space missions is addressed. C.D.

A88-35051

AEROSPACE CENTURY XXI: SPACE MISSIONS AND POLICY; PROCEEDINGS OF THE THIRTY-THIRD ANNUAL AAS INTERNATIONAL CONFERENCE, BOULDER, CO, OCT. 26-29, 1986

GEORGE W. MORGENTHALER, ED. (Colorado, University, Boulder) and GAYLE L. MAY, ED. Conference sponsored by AAS. San Diego, CA, Univelt, Inc., 1987, 685 p. For individual items see A88-35052 to A88-35092.

The present conference discusses the NASA Space Station's evolution and development status, the Spacehab testbed, Space Station benefits from tether operations, the Columbus resource module for ESA's man-tended free-flier, global climate research with Topex/Poseidon, the Saenger and Hotol reusable launcher concepts, the Tethered Satellite System, mission analysis and phased development of a lunar base, and extraterrestrial infrastructure design projects. Also discussed are the Galileo mission to Jupiter and the Magellan mission to Venus; future international space programs; ESA, German, and Japanese space exploration plans; future applications of space law, and recent developments in U.S. space policy and law; space science and

engineering education; and public and professional attitudes to space exploration in the U.S. O.C.

A88-35055* Rockwell International Corp., Downey, CA.
PANEL ON SPACE STATION UTILIZATION BENEFITS
 SY Z. RUBENSTEIN (Rockwell International Corp., Downey, CA), FRANK DRAKE (California, University, Santa Cruz), STANLEY C. WHITE (Bionetics Corp., Pasadena, CA), JAMES V. TARANIK (Nevada, University, Reno), HERMANN JORDAN (DFVLR, Cologne, Federal Republic of Germany), and RAY ARNOLD (NASA, Office of Space Science and Applications, Washington, DC) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 77-87.
 (AAS PAPER 86-421)

An account is given of recent changes in the NASA Space Station, under the guidance of updated user community payload requirements. The user communities are those of astronomy, the life sciences, earth observation, and international applications. Attention is given to the resolutions that will be achievable by astronomical instruments aboard the Space Station, the testing of prototype earth observation instruments aboard the Station's manned module, and the microgravity research efforts planned in conjunction with ESA. O.C.

A88-35123
AEROSPACE CENTURY XXI: SPACE SCIENCES, APPLICATIONS, AND COMMERCIAL DEVELOPMENTS; PROCEEDINGS OF THE THIRTY-THIRD ANNUAL AAS INTERNATIONAL CONFERENCE, BOULDER, CO, OCT. 26-29, 1986

GEORGE W. MORGENTHALER, ED. and JEAN N. KOSTER, ED. (Colorado, University, Boulder) Conference sponsored by AAS. San Diego, CA, Univelt, Inc., 1987, 721 p. For individual items see A88-35124 to A88-35165.

Papers are presented on rocket UV observations of Comet Halley, a space system for microgravity research, transitioning from Spacelab to Space Station science, and assemblers and future space hardware. Also considered are spatial and temporal scales of atmospheric disturbances, Doppler radar for prediction and warning, data management for the Columbus program, communications satellites of the future, and commercial launch vehicles. Other topics include space geodesy and earthquake predictions, inverted cellular radio satellite systems, material processing in space, and potential for earth observations from the manned Space Station. R.R.

A88-35149* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A SYSTEMS-LEVEL PERFORMANCE HISTORY OF GET AWAY SPECIALS AFTER 25 SPACE SHUTTLE MISSIONS
 REX W. RIDENOUR (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Aerospace century XXI: Space sciences, applications, and commercial developments; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 1533-1540.
 (AAS PAPER 86-291)

This paper summarizes the results of a thorough performance study of Get Away Special (GAS) payloads that was conducted in 1986. During the study a complete list of standard and nonstandard GAS payloads vs. Shuttle mission was constructed, including specific titles for the experiments in each canister. A broad data base for each canister and each experiment was then compiled. Performance results were then obtained for all but a few experiments. The canisters and experiments were subsequently categorized according to the degree of experiment success. For those experiments that experienced failures or anomalies, several correlations and generalizations were extracted from individual subsystem performance data. Recommendations are made which may enhance the success and performance of future GAS payloads. Author

A88-35150

NUSAT I - THE FIRST GAS CAN EJECTED SATELLITE
 ROBERT J. TWIGGS (Weber State College, Ogden, UT) IN: Aerospace century XXI: Space sciences, applications, and commercial developments; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 1541-1559. refs
 (AAS PAPER 86-293)

Nusat I, an 18-inch diameter satellite, made history on April 29, 1985 by being the first satellite ejected from a newly designed Get-Away-Special canister on the Challenger orbiter. This ejection marked the beginning of a new era of satellite designs which can be inexpensively placed in orbit via the Space Shuttle. This paper describes the development of that project, including the project organization and funding, satellite design evolution, final design objectives, final satellite assembly and testing, integration before launch, and operational performance. C.D.

A88-35163

HARVESTING NONTERRESTRIAL RESOURCES - A STATUS REPORT

GREGG E. MARYNIAK (Space Studies Institute, Princeton, NJ) IN: Aerospace century XXI: Space sciences, applications, and commercial developments; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 1735-1746. refs
 (AAS PAPER 86-341)

The principal barrier to space exploration and development is the cost of launching materials from the surface of the earth into orbit. This seemingly inescapable obstacle can be overcome by using resources already in space for propellants, shielding, life support and construction. This paper outlines the work of the Space Studies Institute in developing the tools and techniques which will enable the space program to reach a new level of maturity characterized by the use of locally-available resources for space operations. Author

A88-37725#

THE NATIONAL LABORATORIES - PAST AND FUTURE

DONALD P. HEARTH (Colorado, University, Boulder) AIAA, Annual Meeting and International Aerospace Exhibit, Arlington, VA, May 3-5, 1988. 11 p. refs
 (AIAA PAPER 88-4199)

The U.S. system of National Laboratories is examined with a view to their institutional development history and wider economic and technological impact, on the one hand, and on the other the dawning prospects for further contribution to U.S. international competitiveness through collaborative ventures with industrial and academic research institutions. Attention is given to the National Bureau of Standards, and especially to NASA-Langley, which has been an exemplary case of fruitful research endeavor since 1920, and has been singularly prominent during and after World War II. O.C.

A88-38304

30 YEARS OF PROGRESS IN SPACE; PROCEEDINGS OF THE THIRTY-EIGHTH INTERNATIONAL ASTRONAUTICAL CONGRESS, BRIGHTON, ENGLAND, OCT. 10-17, 1987

L. G. NAPOLITANO, ED. (Napoli, Università, Naples, Italy) Congress sponsored by IAF. Acta Astronautica (ISSN 0094-5765), vol. 18, 1988, 398 p. For individual items see A88-38305 to A88-38307.

The present conference gives attention to orbital maneuvering vehicle capabilities, the impact of launch vehicle constraints on NASA Space Station design and operations, the Office of Space Flight satellite servicing program plan, an end-to-end analysis and demonstration of telerobotics and orbital laboratories, a development scenario for the H-II orbiting spaceplane HOPE, navigation of the Hermes spaceplane, and a postoperational disposal strategy for a space nuclear reactor. Also discussed are combined cycle propulsion systems for hypersonic flight, hybrid boosters for future launch vehicles, nuclear rocket safety, the development history of NASA tracking and data acquisition

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networks, the Indian remote sensing program, remote mineralogical and vegetation mapping using imaging spectrometry, and solar system colonization and interstellar migration. O.C.

A88-39048

THE SSD GRAPH - A TOOL FOR PROJECT SCHEDULING AND VISUALIZATION

HYUNG LEE-KWANG (Korean Institute of Technology, Taejon, Republic of Korea) and JOEL FAVREL (Lyon, Institut National des Sciences Appliquees, France) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, Feb. 1988, p. 25-30. refs

A graphic tool, the SSD graph, is proposed for three important phases of project management: planning and scheduling, control, and evaluation. The SSD graph represents the structure, states (scheduled and actual states), and deviation of a system. A project management system using the SSD graph is developed, and it visualizes the actual state of a project and keeps the historical record of the project performance. This system allows a project manager to see overall status and to review the project performance. Several applications have shown its usefulness for scheduling and control of project systems. Author

A88-39330

INTERNATIONAL SPACE SCIENCE

THOMAS M. DONAHUE (Michigan, University, Ann Arbor) Physics Today (ISSN 0031-9228), vol. 41, May 1988, p. 26-29.

A comprehensive evaluation is made of current national and international collaborative resources for space projects and the prospects for their future development. While the space research programs of the USSR, Western Europe, and Japan are flourishing, the delayed resumption of Space Shuttle operations has restricted U.S. efforts to such payloads as may be carried on obsolescent launch vehicles. Nevertheless, brisk activity is noted in U.S. spacecraft manufacture and in the elaboration of ambitious long-term plans for satellites and planetary probes. O.C.

A88-39331

SOVIET SPACE SCIENCE

ROALD Z. SAGDEEV (AN SSSR, Institut Kosmicheskikh Issledovaniy, Moscow, USSR) Physics Today (ISSN 0031-9228), vol. 41, May 1988, p. 30-38.

An evaluation is made of the current status and prospective developments of the USSR space science research effort in astronomy, solar system physics, and space plasma physics, which enjoy the greatest priority. Specific projects are underway for the sending of a landing craft to Mars and its moon, Phobos, using laser and ion beam sounding to study elemental composition; the lofting of the Granat and Spektr-X-gamma X-ray and gamma-ray observatories into orbit; and the placing of a 10-m radio telescope in orbit, in order to conduct interferometric investigations in conjunction with an earth-based instrument. Venus and Comet Halley probes are also contemplated. O.C.

A88-39332

WESTERN EUROPEAN SPACE SCIENCE

IAN AXFORD (Max-Planck-Institut fuer Aeronomie, Katlenburg-Lindau, Federal Republic of Germany) Physics Today (ISSN 0031-9228), vol. 41, May 1988, p. 42-52.

An account is given of the national and ESA-coordinated space science research efforts of the West European countries to date, including the substantial portion of these undertaken in collaboration with NASA, such as the Exosat, COS-B, Geos, and ISEE satellites. Program origins, goals, and achievements are discussed for the cases of SPOT, Giotto, Hipparcos, the IUE, Ulysses, Galileo, Rosat, the IR Space Observatory, and the European Retrievable Carrier. Longer-term plans encompass a Solar-Terrestrial Science Program, a Comet Nucleus Sample Return Mission, the Quasat VLBI worldwide network, and the Cassini Saturn probe. O.C.

A88-39333* National Aeronautics and Space Administration, Washington, DC.

SPACE SCIENCE IN THE UNITED STATES

JOSEPH K. ALEXANDER (NASA, Washington, DC) and FRANK B. MCDONALD (NASA, Goddard Space Flight Center, Greenbelt, MD) Physics Today (ISSN 0031-9228), vol. 41, May 1988, p. 57-65. refs

Despite the hiatus in spacecraft launches after the Space Shuttle Challenger accident in 1986, the U.S. space program continues to generate research data on the basis of the productive operation of 18 scientific spacecraft. Attention is presently given to NASA's planned missions for the 1990s in such fields as astronomy and astrophysics (the Hubble Space Telescope, the Extreme UV Explorer), solar system exploration (the Magellan Venus orbiter, the Galileo Jupiter orbiter), space physics (the Tethered Satellite System, the Combined Release and Radiation Effects Satellite), earth science (the Upper Atmospheric Research Satellite), and microgravity sciences (the International Microgravity Observatory). O.C.

A88-40552* National Aeronautics and Space Administration, Washington, DC.

ROTORCRAFT RESEARCH AT NASA

JOHN S. BURKS (NASA, Washington, DC) Vertiflite (ISSN 0042-4455), vol. 34, May-June 1988, p. 12-17.

An overview of NASA research in rotorcraft technology is presented. Ten percent of the NASA aeronautics program is made up of rotorcraft research. The aeronautics program conducts research in five areas: aerodynamics, propulsion, materials and structures, information sciences and human factors, and flight systems. The key objectives of NASA research are major reduction in external noise and aircraft vibration, reduction of pilot workload for night, adverse weather and NOE flying, increasing power and reducing fuel consumption in small engines, and identifying and exploiting vehicle characteristics and concepts for triple current speed and improved maneuverability and agility. NASA and Army resources are combined to pursue research at three major centers. The Ames research center conducts research in the physics of transition and turbulent flows, using a new improved wind tunnel and the NAS system. At the Langley Research Center, work is done in noise and vibration reduction, finding lighter and more durable composite structures, and aeroelasticity for tilt motors and X-wing configurations. At the NASA Lewis Research Center, researchers are working on improving helicopter propulsion systems. R.B.

A88-41276* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

VISIONS OF TOMORROW: A FOCUS ON NATIONAL SPACE TRANSPORTATION ISSUES; PROCEEDINGS OF THE TWENTY-FIFTH GODDARD MEMORIAL SYMPOSIUM, GREENBELT, MD, MAR. 18-20, 1987

GERALD A. SOFFEN, ED. (NASA, Goddard Space Flight Center, Greenbelt, MD) Symposium sponsored by AIAA, AAS, National Space Club, et al. San Diego, CA, Univelt, Inc. (Science and Technology Series. Volume 69), 1987, 338 p. For individual items see A88-41277 to A88-41290.

The present conference on U.S. space transportation systems development discusses opportunities for aerospace students in prospective military, civil, industrial, and scientific programs, current strategic conceptualization and program planning for future U.S. space transportation, the DOD space transportation plan, NASA space transportation plans, medium launch vehicle and commercial space launch services, the capabilities and availability of foreign launch vehicles, and the role of commercial space launch systems. Also discussed are available upper stage systems, future space transportation needs for space science and applications, the trajectory analysis of a low lift/drag-aeroassisted orbit transfer vehicle, possible replacements for the Space Shuttle, LEO to GEO with combined electric/beamed-microwave power from earth, the National Aerospace Plane, laser propulsion to earth orbit, and a performance analysis for a laser-powered SSTO vehicle. O.C.

A88-41278* National Aeronautics and Space Administration, Washington, DC.

NASA SPACE TRANSPORTATION PLANS AND ROLES OF A MIXED FLEET

DARRELL R. BRANSCOME (NASA, Washington, DC) IN: Visions of tomorrow: A focus on national space transportation issues; Proceedings of the Twenty-fifth Goddard Memorial Symposium, Greenbelt, MD, Mar. 18-20, 1987. San Diego, CA, Univelt, Inc., 1987, p. 93-95.

(AAS PAPER 87-112)

An account is given of the results of a September, 1987 NASA 'mixed fleet' launching resources/scheduling study that predicated capability projections on a fleet of available ELVs. The launch capability projections extended as far as 1995, and in their later phases encompassed the resumption of Space Shuttle operations and the availability of Orbital Maneuvering Vehicle, which could accomplish such things as the reboosting of the Hubble Space Telescope in 1991, and even the Shuttle-Derived Vehicle, of which two distinct concepts are presently being considered; both would heavily rely on Space Shuttle hardware, but would be unmanned.

O.C.

A88-41284

THE FUTURE SPACE TRANSPORTATION NEEDS FOR SPACE SCIENCE AND APPLICATIONS

WILLIAM P. BISHOP (Science Applications International Corp., McLean, VA) IN: Visions of tomorrow: A focus on national space transportation issues; Proceedings of the Twenty-fifth Goddard Memorial Symposium, Greenbelt, MD, Mar. 18-20, 1987. San Diego, CA, Univelt, Inc., 1987, p. 147-161. refs

(AAS PAPER 87-121)

An evaluation is made of the U.S. space science and application missions that have been planned through the year 2000, with a view to trends in their launch vehicle requirements in light of the impact of Space Shuttle operations' curtailment. All unclassified missions are considered, including foreign-origin and defense-related ones. Almost 100 missions involving free fliers or their servicing are noted, as well as nearly 40 Space Shuttle flights with attached payloads. Large orbital observatories are planned; operational missions will require smaller weights and volumes than R&D missions, and there will be more tests of enabling technology.

O.C.

A88-41961

REMOTE SENSING FOR RESOURCES DEVELOPMENT AND ENVIRONMENTAL MANAGEMENT; PROCEEDINGS OF THE SEVENTH INTERNATIONAL SYMPOSIUM, ENSCHEDE, NETHERLANDS, AUG. 25-29, 1986. VOLUMES 1, 2, & 3

M. C. J. DAMEN, ED., G. SICCO SMIT, ED., and H. TH. VERSTAPPEN, ED. (International Institute for Aerospace Survey and Earth Sciences, Enschede, Netherlands) Symposium sponsored by the International Society of Photogrammetry and Remote Sensing (Commission VII) and Netherlands Remote Sensing Board. Rotterdam, A. A. Balkema, 1986, p. Vol. 1, 562 p.; vol. 2, 414 p.; vol. 3, 115 p. For individual items see A88-41962 to A88-42070.

Papers and working group conclusions and recommendations are presented concerning the use of remote sensing for resources development and environmental management in the fields of visible and infrared data, microwave data, spectral signatures of objects, renewable resources in rural areas, nonrenewable resources, hydrology, human settlements, and geoinformation systems. Topics covered include methods of image and data processing and classification, the use of remote sensing for geological analysis, satellite mapping of vegetation, forestry, agriculture, soil survey, and land and water use. The use of remote sensing in geomorphology, oceanography and engineering projects, satellite observation of surface water, coastal zones, ice and snow, and remote sensing for urban surveys, human settlement analysis, and archeology, and the analysis of data obtained by Landsat, SIR-A, SIR-B, SLAR, and SPOT systems are also discussed.

R.B.

A88-42908*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

PREPARATION FOR MICROGRAVITY - THE ROLE OF THE MICROGRAVITY MATERIAL SCIENCE LABORATORY

J. CHRISTOPHER JOHNSTON, BRUCE N. ROSENTHAL, MARYJO B. MEYER, and THOMAS K. GLASGOW (NASA, Lewis Research Center, Cleveland, OH) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 5 p. refs (AIAA PAPER 88-3510)

Experiments at the NASA Lewis Research Center's Microgravity Material Science Laboratory using physical and mathematical models to delineate the effects of gravity on processes of scientific and commercial interest are discussed. Where possible, transparent model systems are used to visually track convection, settling, crystal growth, phase separation, agglomeration, vapor transport, diffusive flow, and polymer reactions. Materials studied include metals, alloys, salts, glasses, ceramics, and polymers. Specific technologies discussed include the General Purpose furnace used in the study of metals and crystal growth, the isothermal dendrite growth apparatus, the electromagnetic levitator/instrumented drop tube, the high temperature directional solidification furnace, the ceramics and polymer laboratories and the center's computing facilities.

R.B.

A88-43247

SCIENTIFIC AND ECONOMY-ORIENTED SPACE SYSTEMS /REVISED EDITION/

V. S. AVDUEVSKII and G. R. USPENSKII (Narodnokhoziaistvennyye i nauchnye kosmicheskie komplekxy, Moscow, Izdatel'stvo Mashinostroenie, 1985) Moscow, MIR Publishers, 1988, 440 p. Translation. Previously cited in issue 13, p. 1803, Accession no. A86-29843. refs

A88-43299*#

SPACECRAFT TECHNOLOGY REQUIREMENTS FOR FUTURE NASA MISSIONS

WAYNE R. HUDSON and GORDON I. JOHNSTON (NASA, Washington, DC) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 10 p. refs (AIAA PAPER 88-3487)

By working with advanced planners in the NASA Office of Space Science and Applications (OSSA), a spacecraft technology model has been generated that represents the predominant themes of their respective programs for the next twenty years. This set of missions serves as a base from which a few representative and challenging landmark missions have been extracted to serve as a focal point for identifying the most critical technology issues. Each mission requires significant advances in several technology disciplines in order to be feasible. The mission set selected to serve as a technology focus reflects the increased emphasis within NASA on a potential civil space leadership initiative, and include the Geostationary Earth Observing Platform from the Planet Earth initiative and the precursor Mars Rover and Sample Return mission from the Mars Exploration Initiative. These missions are briefly described and the key technology requirements are discussed.

Author

A88-43953#

RECONSIDERING ARTIFICIAL GRAVITY FOR TWENTY-FIRST CENTURY SPACE HABITATS

PETER H. DIAMANDIS (MIT, Cambridge, MA) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 55-68. Research supported by the Space Studies Institute. refs

The medical bases for development of artificial gravity systems that can be incorporated by spacecraft on long duration missions, orbital habitats, and lunar and asteroidal bases are presented. After giving an account of the renal, cardiovascular, and musculoskeletal effects of weightlessness, attention is given to such considerations as how much artificial gravity is required, the physiological limits of radii and angular velocity for centrifugal

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artificial gravity systems, and the economic limits to radius and angular velocity. Motion sickness due to Coriolis cross-coupled accelerations is identified as a major problem. O.C.

A88-43959#

LOW EARTH ORBIT SPACE FARM

STEPHEN M. BULL, NILS BRUNN, and RANDOLPH LIEBELT (Medaris Industries, New York) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 102-111. refs

The paper proposes a modular low earth orbit space farm which combines the current CELSS technology with a single launch, artificial gravity space vehicle to provide fresh produce to a nearby space station crew in a balanced exchange for their biodegradable waste and carbon dioxide. While growing a substantial amount of produce, the space farm will also be developing the plant propagation technology for transfer to future lunar colonies and to accompany long range space missions, i.e., interplanetary exploration. The components of the space farm will be launched by conventional booster, then manned, assembled and operated by a crew of two. Since the space farm is habitable during all stages of development, the Shuttle rendezvous to deliver the crew will be brief. Adding modules will facilitate increasing crop yields.

Author

A88-44002#

SPACE COMMERCIALIZATION - AN OVERVIEW BY AN AEROSPACE CORPORATION

J. T. VIOLA (Rockwell International Science Center, Thousand Oaks, CA) IN: Advanced topics in manufacturing technology: Product design, bioengineering; Proceedings of the Symposium, ASME Winter Annual Meeting, Boston, MA, Dec. 13-18, 1987. New York, American Society of Mechanical Engineers, 1987, p. 53-57.

The development of user-friendly access to space experimentation by the provision of flight hardware and integration services is discussed, giving examples of specific processing experiments being conducted in earth orbit. Semiconductor crystal growth is examined, emphasizing low-gravity growth of II-VI alloys, CdTe crystal growth, float-zone crystal growth of low melting elements, and photochemical beam epitaxy of II-VI compounds. A project concerning microgravity welding is presented, and participation in NASA Centers for the Commercial Development of Space is discussed. R.B.

A88-44006*# National Aeronautics and Space Administration, Washington, DC.

MICROGRAVITY SCIENCE AND APPLICATIONS PROJECTS AND PAYLOADS

R. K. CROUCH (NASA, Microgravity Science and Applications Div., Washington, DC) IN: Advanced topics in manufacturing technology: Product design, bioengineering; Proceedings of the Symposium, ASME Winter Annual Meeting, Boston, MA, Dec. 13-18, 1987. New York, American Society of Mechanical Engineers, 1987, p. 85-88.

An overview of work conducted by the Microgravity Science and Applications Division of NASA is presented. The goals of the program are the development and implementation of a reduced-gravity research, science and applications program, exploitation of space for human benefits, and the application of reduced gravity research for the development of advanced technologies. Space research of fluid dynamics and mass transport phenomena is discussed and the facilities available for reduced gravity experiments are presented. A program for improving communication with the science and applications communities and the potential use of the Space Station for microgravity research are also examined. R.B.

A88-44150

THE U.S. SPACE STATION - A QUARTER-CENTURY OF EVOLUTION

PHILIP D. HATTIS (Charles Stark Draper Laboratory., Inc., Cambridge, MA) Technology Review (ISSN 0040-1692), vol. 91, July 1988, p. 28-40.

In October, 1986, NASA Langley's Critical Evaluation Task Force recommended that the Space Station be built in two phases. The relatively modest Phase I station would encompass the central horizontal truss of the dual-keel model, together with all pressurized modules; this would entail 19 Space Shuttle flights over three years. Phase II, for which funding approval would be sought only after substantial progress toward launching Phase I, would use six additional Shuttle flights to put the full dual-keel Space Station configuration in operating order. As Phase I is embarked upon, major programmatic questions remain as to the intersection of military and international interests in the Space Station's design and use. O.C.

A88-44613

NASA'S PATHFINDER PLOTS FUTURE US SPACE ACTIVITIES

ANDREW WILSON Interavia (ISSN 0020-5168), vol. 43, June 1988, p. 591-593.

NASA's \$850-million 'Pathfinder' project has as its goal the definition and development of generic technologies for future missions beyond earth orbit; these are grouped under the categories of 'exploration', 'operations', 'transfer vehicles', and 'human life support'. Pathfinder will attempt to define advanced capabilities for both manned and unmanned ventures, of which the latter may be typified by a Mars sample-return mission by 1998. A Mars mission would entail substantial development of such techniques as aerobraking, in order to reduce spacecraft earth departure masses by up to 50 percent, as well as electric propulsion and controlled-environment life-support systems. O.C.

A88-44856

PHYSICS OF THE GALAXY AND INTERSTELLAR MATTER

HELMUT SCHEFFLER (Landessternwarte Koenigstuhl, Heidelberg, Federal Republic of Germany) and HANS ELSAESSER (Max-Planck-Institut fuer Astronomie, Heidelberg, Federal Republic of Germany) Berlin and New York, Springer-Verlag, 1987, 503 p. Translation. refs

Issues pertaining to the stellar system, interstellar matter, and dynamics and evolution are reviewed. Included in the discussion of the positions and motions of stars are astronomical coordinate systems, temporal changes of the star coordinates, and space velocities and solar motion. The structure and kinematics of the stellar system are discussed as well as interstellar phenomena and the physics of interstellar matter. The dynamics of the Galaxy is discussed with attention given to stellar dynamics, the gravitation theory of the spiral structure, and the dynamics of the interstellar gas. K.K.

A88-45037* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

FLIGHT AND GROUND PACKET TELEMETRY SYSTEMS

ACTIVITIES AT NASA'S GODDARD SPACE FLIGHT CENTER

RICHARD D. CARPER (NASA, Goddard Space Flight Center, Greenbelt, MD) British Interplanetary Society, Journal (ISSN 0007-084X), vol. 41, July 1988, p. 325-328. refs

NASA's Goddard Space Flight Center (GSFC) has the responsibility for the telemetry ground data processing for two current spacecraft which use packet telemetry. These spacecraft are the Hubble Space Telescope (HST) and the Gamma Ray Observatory (GRO). GSFC has designed and built two ground systems to meet this responsibility. The first is the HST DATA Capture Facility (DCF), which has now completed its integration and test phase and is supporting spacecraft and data flow tests. The second is the Packet Processor System (Pacor). This system became operational in July 1987. These systems are known generally as Level Zero Processors. Level Zero Processors ingest telemetry composite bit streams, output selected user specific data in real time, and in a batch mode perform all necessary processing to produce individual user data files which are, within the limits of the quality of the received data, contiguous, complete, ordered and nonredundant. Author

A88-45112

EARTH OBSERVATION PROGRAM IN JAPAN AND ITS INTERNATIONAL COOPERATIVE ACTIVITIES

TAKESHI MASUDA, TASUKU TANAKA, MASAHIRO KOJIMA, and KOHEI CHO (National Space Development Agency of Japan, Tokyo) *Geocarto International* (ISSN 1010-6049), vol. 3, June 1988, p. 3-12.

An overview of the Japanese Earth Observation Program including the Marine Observation Satellite (MOS-1), the Earth Resources Satellite (ERS-1), the Advanced Earth Observing Satellite, the Polar Orbiting Platform (POP), and the program's international cooperative activities is presented. The MOS-1 is an experimental satellite to establish technology for observing the earth, primarily the oceans. The system parameters of mission instruments, the function and characteristics of sensors and satellite systems and data usefulness of the MOS-1 are being evaluated in the MOS-1 verification program. The goals of the ERS-1 program are to establish SAR and high resolution optic sensor technology primarily for geological and topographical survey. The ADEOS, to be launched in the 1990s, will carry two core sensors, the Ocean Color and Temperature Scanner and the Advanced Visible and Near Infrared Radiometer. NASDA is working with NASA, NOAA, ESA, and Canada to develop the POP program. R.B.

A88-45597

PHYSICS OF MASSIVE NEUTRINOS

FELIX BOEHM and PETR VOGEL (California Institute of Technology, Pasadena) Cambridge and New York, Cambridge University Press, 1987, 216 p. refs

Various aspects of neutrino physics are described with particular attention given to current knowledge concerning neutrino mass and particle-antiparticle symmetry. Topics include kinematic tests for neutrino mass, cross sections of neutrino-induced reactions, and heavy neutrinos and neutrino decay. Consideration is also given to neutrino oscillations and double beta decay. K.K.

A88-45599

GALACTIC DYNAMICS

JAMES BINNEY (Oxford University, England) and SCOTT TREMAINE (Toronto, University, Canada) Princeton, NJ, Princeton University Press, 1987, 747 p. refs

A comprehensive review of the theory of galactic dynamics is presented. Key empirical facts about stellar systems are briefly reviewed, and the ingredients needed to construct galaxy models are assembled, including potential theory, stellar orbits, and the theory of the equilibrium configurations of stellar systems. The stability of these configurations and the theory of spiral structures are discussed. Collisions and encounters between stellar systems are considered, and two-body realization and the approach to statistical equilibrium in star clusters are addressed. It is shown how the observable properties of galaxies such as their luminosities and colors are changed by the aging of their constituent stellar populations. Finally, it is shown that most of the mass in the universe is locked up in some still invisible form. C.D.

A88-45605* Delaware Univ., Newark.

SPACE 2000: MEETING THE CHALLENGE OF A NEW ERA

HARRY L. SHIPMAN (Delaware, University, Newark) Research supported by the John Simon Guggenheim Memorial Foundation, Research Corp., NASA, and NSF. New York, Plenum Press, 1987, 439 p. refs

The focus of the present book is on the variety of past and future human activities in space. NASA's response to the Challenger explosion is discussed and an overview is given of the agency's relations with foreign competitors in the 1980s. The practical uses of space are described with attention given to communications satellites, the orbital high ground (weather watching, spying, and SDI), earth science, and materials processing in space. Other topics include the exploration of the near and distant universe, and permanent stations in space and on the moon. K.K.

A88-46228* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

TURBULENT DRAG REDUCTION RESEARCH AT NASA LANGLEY - PROGRESS AND PLANS

S. P. WILKINSON, J. B. ANDERS, B. S. LAZOS, and D. M. BUSHNELL (NASA, Langley Research Center, Hampton, VA) *IN: Turbulent drag reduction by passive means; Proceedings of the International Conference, London, England, Sept. 15-17, 1987. Volume 1. London, Royal Aeronautical Society, 1987, p. 1-32. refs*

Prospective research efforts planned at NASA-Langley in view of results obtained to date in passive turbulent drag reduction experiments are discussed. It has been established that conventional flow-aligned riblets are effective even in the presence of a degree of flow inclination and pressure gradients, and at transonic speeds. No increase in net drag reduction is expected from nonconventional riblet geometries. Large eddy breakup devices promise drag reductions in the 8-15 percent range. Heat transfer-augmentation, noise-reduction, turboprop/fuselage interaction noise reduction, are other advantages expected from this line of research. O.C.

A88-46299

REVIEW OF RADIO SCIENCE 1984-1986

G. HYDE, ED. (COMSAT Laboratories, Clarksburg, MD) Brussels, Belgium, International Union of Radio Science, 1987, 184 p. No individual items are abstracted in this volume.

Theoretical, experimental, and applications aspects of radio science are examined in a collection of subject-area reviews. Topics addressed include EM metrology, fields and waves, signals and systems, electronic and optical devices and their applications, and EM noise and interference. Consideration is given to wave propagation and remote sensing, ionospheric radio and wave propagation in plasmas, radio astronomy, and the biological effects of EM waves. An extensive glossary of acronyms is provided. T.K.

A88-46300

LASER DIAGNOSTICS AND MODELING OF COMBUSTION

KAZUO IINUMA, ED. (Hosei University, Koganei, Japan), TSUYOSHI ASANUMA, ED. (Tokai University, Hiratsuka, Japan), TOSHIHIKO OHSAWA, ED. (Tokyo University of Agriculture and Technology, Koganei, Japan), and JUNTA DOI, ED. (Tokyo, University, Japan) Berlin and New York, Springer-Verlag, 1987, 373 p. No individual items are abstracted in this volume.

Recent advances in the experimental measurement and theoretical modeling of combustion processes are examined in chapters contributed by leading Japanese experts. Topics addressed include the principles of LDV, LDV techniques for combustors, spray and soot measurements, Raman and non-Raman spectroscopy, imaging techniques, and image processing. Consideration is given to molecular-process analysis, models of combustion in piston engines, analysis of burner systems, flow simulations, and combustion simulations. Extensive diagrams, drawings, graphs, and photographs are provided. T.K.

A88-46305

MATERIALS SCIENCE IN SPACE: THEORY-EXPERIMENTS-TECHNOLOGY

LIA L. REGEL (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovani, Moscow, USSR) (Itogi Nauki i Tekhniki, Seria Issledovanie Kosmicheskogo Prostranstva, vol. 21, 1984) New York, Halsted Press, 1987, 253 p. Translation. Previously cited in issue 03, p. 270, Accession no. A85-13500. refs

A88-46306

THE STRUCTURE OF THE PLANETS

JOHN ELDER London, Academic Press, 1987, 227 p. refs

The dynamical, chemical, and structural evolution of the solar system is surveyed from a unified perspective, combining data from recent astronomical and geological investigations. Topics addressed include models of solar-system origin, the emergence of the solar disk, the evolution of the hydrogen bodies, degassing

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and core formation on the prototerrestrial planets, the onset of geological time, chemical and physical development, and thermal history. Diagrams, graphs, and tables of numerical data are provided. T.K.

A88-49090*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

GROUND-BASED MICROGRAVITY MATERIALS SCIENCE RESEARCH AT NASA'S MICROGRAVITY MATERIALS SCIENCE LABORATORY

BRUCE N. ROSENTHAL (NASA, Lewis Research Center, Cleveland, OH) Metallurgical Transactions A - Physical Metallurgy and Materials Science (ISSN 0360-2133), vol. 19A, Aug. 1988, p. 1915-1917.

A88-49630

PULSARS - AN OVERVIEW OF RECENT DEVELOPMENTS

J. H. TAYLOR (Princeton University, NJ) IN: Texas Symposium on Relativistic Astrophysics, 13th, Chicago, IL, Dec. 14-19, 1986, Proceedings. Singapore and Teaneck, NJ, World Scientific Publishing Co., 1987, p. 467-477. refs

A88-49820#

THE EUROPEAN LONG-TERM SPACE PLAN

K.-E. REUTER (ESA, Coordination and Monitoring Office, Paris, France) ESA Bulletin (ISSN 0376-4265), no. 54, May 1988, p. 14-29.

A recent proposal for a coherent European space program for the 1990s and beyond is outlined. The proposed scientific program includes solar terrestrial science research, missions to asteroids and comets, and a spectroscopic observatory for X-ray sources. The earth observing program will involve the use of polar orbiting systems for studying ice, the ocean, coastal processes, and meteorology. The microgravity research program, including the Man-Tended Free Flyer and Eureca, and the telecommunications program are also considered. Other topics discussed include the Space Station and space platforms programs, the space-transportation program, space infrastructure operations, the future ground infrastructure, and organizational and budgetary considerations. R.R.

A88-50209*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NASA OFFICE OF SPACE SCIENCES AND APPLICATIONS STUDY ON SPACE STATION ATTACHED PAYLOAD POINTING

R. A. LASKIN, J. M. ESTUS, Y. H. LIN, J. T. SPANOS, and C. M. SATTER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: AIAA Guidance, Navigation and Control Conference, Minneapolis, MN, Aug. 15-17, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 430-443. refs (AIAA PAPER 88-4105)

A study has been conducted to determine the articulated-pointing requirements of a suite of instruments carried by the NASA Space Station, and define a pointing system architecture accommodating those requirements. It is found that these pointing requirements are sufficiently exacting, and the Space Station's disturbance environment sufficiently severe, to preclude the successful use of a conventional gimbal-pointing system; a gimballed system incorporating an isolation stage is judged capable of furnishing the requisite levels of pointing performance. O.C.

A88-51422

U.S. SCIENTISTS VIEW FUTURE MARS MISSIONS - IS THE 'SEARCH FOR LIFE' A PRIMARY GOAL

DONALD F. ROBERTSON Space Markets (ISSN 0258-4212), Summer 1988, p. 72-75.

The data used in the search for signs of life on Mars are discussed. The Viking mission, the Mars Rover and Sample Return mission, and possible future missions are included. The use of soil samples, the question of which data are evidence for life, and the value of generalized observations are examined. The

possibility that a lack of life on Mars will lead to a rethinking of chemical evolutionary theory is considered and the benefits from manned and automated missions are compared. R.B.

A88-53176* Fermi National Accelerator Lab., Batavia, IL. ADVANCES IN CRYOGENIC ENGINEERING. VOLUME 33 - PROCEEDINGS OF THE CRYOGENIC ENGINEERING CONFERENCE, SAINT CHARLES, IL, JUNE 14-18, 1987

R. W. FAST, ED. (Fermi National Accelerator Laboratory, Batavia, IL) Conference sponsored by Air Products and Chemicals, Inc., NASA, NBS, et al. New York, Plenum Press, 1988, 1199 p. For individual items see A88-53177 to A88-53235.

Papers are presented on superconductivity applications including magnets, electronics, rectifiers, magnet stability, coil protection, and cryogenic techniques. Also considered are insulation, heat transfer to liquid helium and nitrogen, heat and mass transfer in He II, superfluid pumps, and refrigeration for superconducting systems. Other topics include cold compressors, refrigeration and liquefaction, magnetic refrigeration, and refrigeration for space applications. Papers are also presented on cryogenic applications, commercial cryogenic plants, the properties of cryogenic fluids, and cryogenic instrumentation and data acquisition. R.R.

A88-53301

ADVANCES IN CRYOGENIC ENGINEERING (MATERIALS). VOLUME 34 - PROCEEDINGS OF THE SEVENTH INTERNATIONAL CRYOGENIC MATERIALS CONFERENCE, SAINT CHARLES, IL, JUNE 14-18, 1987

A. F. CLARK, ED. and R. P. REED, ED. (NBS, Boulder, CO) New York, Plenum Press, 1988, 1090 p. For individual items see A88-53302 to A88-53323.

Various papers covering advances in cryogenic engineering materials are presented. The general topics addressed are: composite insulators, alloy development, mechanical and physical properties, mechanical property test variables, A15 conductors, high critical temperature superconductors, Chevrel phases, flux pinning, superconducting films and junctions, superconducting filaments, and superconducting conductors. C.D.

A88-53302

HOTOL - A CRYOGENIC MATERIALS CHALLENGE

S. WALMSLEY and J. WILSON (British Aerospace, PLC, Military Aircraft Div., Preston, England) IN: Advances in cryogenic engineering (Materials). Volume 34 - Proceedings of the Seventh International Cryogenic Materials Conference, Saint Charles, IL, June 14-18, 1987. New York, Plenum Press, 1988, p. 1-10.

HOTOL (Horizontal Take-Off and Land) will be a fully reusable single-stage-to-orbit unmanned launch vehicle with a service life of 120 flights. A fundamental feature of the design is that the propellant tanks constitute an integral part of the airframe. In this paper, the HOTOL concept, design features, mission, and selection of materials for the cryogenic propellant tanks are discussed. C.D.

A88-53517#

NASA RESEARCH AND DEVELOPMENT - A RETURN TO LEGITIMACY

ANGELA L. PRAY AIAA Student Journal (ISSN 0001-1460), vol. 26, Summer 1988, p. 24-30. refs

It is suggested that an at once pragmatic and fundamental solution to the difficulties in which NASA has found itself in the wake of the Space Shuttle Challenger accident is to reassert NASA's original orientation toward R and D. In an R and D-dominated institutional climate, goals and limits are more easily adhered to without the forcing of goal definition or breaking of established limits by unexpected operational costs. Such a basis for meticulous planning would also ease funding rivalries among alternative programs. ESA is held out as a model for such a redirection of NASA activities, in view of its clear separation between R and D and operational responsibilities. O.C.

A88-53695

MEASUREMENT OF OUTPUT FROM UNIVERSITY RESEARCH: A CASE STUDY

J. T. WALLMARK, D. H. MCQUEEN, and K. G. SEDIG (Chalmers Tekniska Hogskola, Goteborg, Sweden) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, Aug. 1988, p. 175-180. refs

A case study to test the feasibility of measuring output from university research has been performed at Chalmers University of Technology based on five categories: graduate degrees awarded, scientific publications, citations, and spin-off companies. These outputs have been subjectively combined into a merit figure and compared to inputs in the form of department budgets and other outputs such as the teaching load. Regression analyses with the budget allocated with a peer review have been made. Cost estimates for the measurement method are presented. The method has also been compared to a peer review method. I.E.

A88-53749

SECOND THOUGHTS ON THE WAY TO THE STATION

DAVID BAKER New Scientist (ISSN 0028-6664), vol. 119, Aug. 25, 1988, p. 41-44.

The development of the Space Station is discussed. The stages of constructing the Station are presented, including an outline of the flights involved and what they would carry. The Station design is described and illustrated, including the elements of the Space Station contributed by Europe and Japan. Economic considerations, the problem of debris in space, and problems which might be caused by a delay during the stages of construction are considered. R.B.

A88-53766#

THE APOLLO LIGHTCRAFT PROJECT

M. A. ANTONISON, W. L. SMITH, and L. N. MYRABO (Rensselaer Polytechnic Institute, Troy, NY) AIAA, AHS, and ASEE, Aircraft Design, Systems and Operations Meeting, Atlanta, GA, Sept. 7-9, 1988. 7 p.

(AIAA PAPER 88-4486)

The NASA-sponsored 'Apollo Lightcraft Project' systems-integration and analysis effort is concerned with a high energy beam-powered SSTO vehicle for 21st-century operation that will reduce payload transportation costs by a factor of 1000 below those typical of the current Space Shuttle. Both laser and microwave beams are under consideration, as well as innovative combined-cycle airbreathing/rocket engines. The five-crewmember vehicle was inspired by the Apollo command module; 500-kg of the 5550-kg gross liftoff mass of the vehicle will constitute the payload, and 300 kg the LH2 propellant. O.C.

A88-53848

ADVANCES IN GEOPHYSICS. VOLUME 30

BARRY SALTZMAN, ED. (Yale University, New Haven, CT) San Diego, CA, Academic Press, Inc, 1988, 252 p. No individual items are abstracted in this volume.

Recent advances in selected areas of geophysics are addressed. Selected P wave problems are considered, including multiple P waves, P wave reflections, and travel times of diffracted P waves. Topics related to ocean currents over the continental slope are examined, including the observational evidence, the fundamental slope effect, vortex tube stretching versus vorticity advection, topographic waves, pressure torque versus bottom stress curl, and pressure torque and planetary vorticity advection. Obtaining attractor dimensions from meteorological time series is addressed, including the basis of model reconstruction and the calculation of attractor dimensions. C.D.

A88-54790

MICROGRAVITY RESEARCH - THE CURRENT SITUATION

VINIT NIJHAWAN (Payload Systems, Inc., MA) and PETER PLETSCHACHER Space Markets (ISSN 0258-4212), Autumn 1988, p. 160-162, 164-167.

Microgravity research projects being conducted by industries and governmental agencies in the U.S., Canada, and West Germany

are reviewed. NASA and private activities in the U.S. are discussed, focusing on protein crystallization and life sciences. Work being conducted at NASA microgravity research centers and centers for the commercial development of space is presented in tables. Activities in West Germany, including ground-based drop towers and balloons, parabolic micro-gravity flights, and sounding rockets are examined. Cooperative research between industries in West Germany and the Soviet Union and China are discussed and the development of recoverable capsules is considered. R.B.

A88-54854*# National Aeronautics and Space Administration, Washington, DC.

BEYOND THE STATION

JOHN C. MANKINS (NASA, Washington, DC) Aerospace America (ISSN 0740-722X), vol. 26, Sept. 1988, p. 30-32.

The NASA Pathfinder program for sending humans and robots to explore the solar system is discussed. The various technologies which are to be developed to support the program are described, emphasizing technology for an in-situ resource-processing plant for production of oxygen on the moon and space nuclear power for propulsion to the outer planets. The use of Pathfinder to validate advanced propulsion concepts and the use of aerobraking to land on Mars are discussed. Communications between Mars and earth are addressed. Mission scenarios currently under consideration for Pathfinder are examined. C.D.

A88-54876

DEVELOPMENTS IN MECHANICS. VOLUMES 14(A), 14(B), & 14(C) - MIDWESTERN MECHANICS CONFERENCE, 20TH, PURDUE UNIVERSITY, WEST LAFAYETTE, IN, AUG. 31-SEPT. 2, 1987, PROCEEDINGS

Conference sponsored by Purdue University. West Lafayette, IN, Purdue University, 1987, p. Vol. 14(a), 519 p.; vol. 14(b), 507 p.; vol. 14(c), 502 p. For individual items see A88-54877 to A88-54982.

Papers are presented on beam vibration, turbulent flow, pressure vessels, plasticity, fracture mechanics, stochastics, elastic stability, and space structures and bridges. Also considered are shell vibration, design optimization, plate vibration, numerical methods in fluid mechanics, contact mechanics, constitutive models, turbulent and wake flow, and buckling. Other topics include composite shells, nonlinear vibrations, suspended particles, geomechanics, acoustics, chaotic motion, and dissimilar materials. Papers are also presented on fluid-structure interactions, tribology, thermoelasticity, active vibration control, creep, vehicle and tire mechanics, and residual stresses. R.R.

A88-55022*# European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk (Netherlands).

CLUSTER AND SOHO - A JOINT ENDEAVOR BY ESA AND NASA TO ADDRESS PROBLEMS IN SOLAR, HELIOSPHERIC, AND SPACE PLASMA PHYSICS

RUDOLF SCHMIDT, VICENTE DOMINGO (ESA, Space Science Dept., Noordwijk, Netherlands), STANLEY D. SHAWHAN, and DAVID BOHLIN (NASA, Washington, DC) EOS (ISSN 0096-3941), vol. 69, March 29, 1988, p. 177, 179, 180, 189, 190. refs

The NASA/ESA Solar-Terrestrial Science Program, which consists of the four-spacecraft cluster mission and the Solar and Heliospheric Observatory (SOHO), is examined. It is expected that the SOHO spacecraft will be launched in 1995 to study solar interior structure and the physical processes associated with the solar corona. The SOHO design, operation, data, and ground segment are discussed. The Cluster mission is designed to study small-scale structures in the earth's plasma environment. The Soviet Union is expected to contribute two additional spacecraft, which will be similar to Cluster in instrumentation and design. The capabilities, mission strategy, spacecraft design, payload, and ground segment of Cluster are discussed. R.B.

A88-55025

SATELLITE COMMUNICATION SYSTEMS

B. G. EVANS, ED. (Surrey, University, Guildford, England) London,

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Peter Peregrinus, Ltd. (IEE Telecommunications Series. Volume 18), 1987, 475 p. No individual items are abstracted in this volume.

Technological and applications aspects of satellite communication (SC) are examined in chapters contributed by leading experts. Topics addressed include SC organizations, multiple-access techniques, the electromagnetic spectrum and its regulation, propagation and interference problems, modulation and modems, coding, networking and services, earth-station and satellite antennas, repeaters, and spacecraft engineering. Consideration is given to military SC, space stations and earth-resources platforms, data-relay satellites, direct-broadcasting satellites, cost-effective spacecraft engineering for LEO satellites, project organization and costing, and future trends. T.K.

A88-55239

THE NEXT STEPS - 20 POSSIBILITIES

A. TOUGH (Toronto, University, Canada) IN: Bioastronomy - The next steps; Proceedings of the Ninety-ninth IAU Colloquium, Balaton, Hungary, June 22-27, 1987. Dordrecht, Kluwer Academic Publishers, 1988, p. 397-404. refs

In the field of bioastronomy, at least 20 search strategies and other next steps are possible at present. Twenty possible strategies and projects are listed. They are arranged in five clusters: (1) develop the field of bioastronomy and its ideas; (2) search beyond the solar system; (3) search inside the solar system; (4) search the earth; and (5) take action to make the contact beneficial. Three assessments are provided for each strategy: (1) the likelihood of success if there are adequate effort and funding; (2) the magnitude of benefits to humanity if it is successful; and (3) the likely payoff from greatly increased effort and resources. It is concluded that nine strategies are particularly high-priority but all nine are neglected or at least underfunded at present. Author

A88-55410*# National Aeronautics and Space Administration, Washington, DC.

THE CHALLENGE OF HUMAN EXPLORATION

JOHN AARON (NASA, Office of Exploration, Washington, DC) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 7 p. (IAF PAPER 88-387)

The new U.S. space policy has as its goal the expansion of human activity and presence beyond low-earth orbit and into the solar system. This paper addresses the approach and initial steps that have been taken toward this goal. Studies being undertaken to identify the requirements to achieve the goal are addressed, and the main themes involved in the exploration of space are described. Exploration strategies and scenarios involving human expeditions, scientific outposts in space, and evolutionary expansion into space are examined. A human space exploration roadmap is shown. C.D.

A88-55433*# George Washington Univ., Washington, DC.

EARTH BENEFITS FROM SPACE LIFE SCIENCES

V. GARSHNEK (George Washington University, Washington, DC), A. E. NICOGOSSIAN, and L. GRIFFITHS (NASA, Washington, DC) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 5 p. refs (IAF PAPER 88-500)

The applications to medicine of various results from space exploration are examined. Improvements have been made in the management of cardiovascular disease, in particular the use of the ultrasonic scanner to image arteries in three dimensions, the use of excimer lasers to disrupt arterial plaques in coronary blood vessels, and the use of advanced electrodes for cardiac monitoring. A bone stiffness analyzer has helped to diagnose osteoporosis and aid in its treatment. An automated light microscope system is used for chromosome analysis, and an X-ray image intensifier called Lixiscope is used in emergency medical care. An advanced portable defibrillator has been developed for the heart, and an insulin delivery system has been derived from space microminiaturization techniques. C.D.

A88-55486

SPACE STATION - HOME AND WORKPLACE IN ORBIT

JERRY GOLDMACHER and JOHN MOCKOVCIK, JR. (Grumman Corp., Bethpage, NY) Horizons (ISSN 0095-7615), vol. 24, no. 1, 1988, p. 10-15, 17.

The design of the Space Station is examined, focusing on plans for the living quarters. The process for building the station in space is outlined and the construction of a mockup of the habitation module are considered. Problems in designing the living quarters include accounting for the size range of astronauts, providing privacy, noise reduction, creating an area suitable for exercise, and allowing enough storage space. Plans for maintaining a sterile laboratory and providing equipment for personal hygiene are presented. The ability to repair all of the Space Station equipment in place and plans for dealing with emergency situations are discussed. R.B.

N88-10084*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

SPACECRAFT 2000

Jul. 1986 236 p Workshop held in Cleveland, Ohio, 29-31 Jul. 1986

(NASA-CP-2473; E-3358; NAS 1.55:2473) Avail: NTIS HC A11/MF A01 CSCL 22B

The objective of the Workshop was to focus on the key technology area for 21st century spacecraft and the programs needed to facilitate technology development and validation. Topics addressed include: spacecraft systems; system development; structures and materials; thermal control; electrical power; telemetry, tracking, and control; data management; propulsion; and attitude control.

N88-10819*# National Academy of Sciences - National Research Council, Washington, DC. Committee on Advanced Space Technology.

SPACE TECHNOLOGY TO MEET FUTURE NEEDS

1987 183 p Original contains color illustrations

(Contract NASW-4003)

(NASA-CR-181473; NAS 1.26:181473) Avail: NTIS HC A09/MF A01 CSCL 22A

Key technologies were identified where contemporary investments might have large payoffs in technological options for the future. The future needs were considered for space transportation, space science, national security, and manned missions. Eight areas were selected as being vital for the national future in space. Findings regarding representative mission and the recommendations concerning high priority technologies are summarized. B.G.

N88-10870*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

SPACE CONSTRUCTION

JANE A. HAGAMAN, ed. Oct. 1987 308 p Conference held in Hampton, Va., 6-7 Aug. 1986

(NASA-CP-2490; L-16378; NAS 1.55:2490) Avail: NTIS HC A14/MF A01 CSCL 22B

The purpose was to present to the aerospace community an in-depth review of Experimental Assembly of Structures on EVA (EASE)/Assembly Concept for Construction of Erectable Space Structures (ACCESS) space flight experiments and to present the status of activities regarding future space flight experiments and accompanying technology developments that will demonstrate the capability of on-orbit construction required for the Space Station.

N88-10875*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

MARSHALL SPACE FLIGHT CENTER'S ROLE IN

EASE/ACCESS MISSION MANAGEMENT

GERALD W. HAWKINS /n NASA, Langley Research Center, Hampton, Va. Space Construction p 67-80 Oct. 1987
Avail: NTIS HC A14/MF A01 CSCL 22B

The Marshall Space Flight Center (MSFC) Spacelab Payload Project Office was responsible for the mission management and

development of several successful payloads. Two recent space construction experiments, the Experimental Assembly of Structures in Extravehicular Activity (EASE) and the Assembly Concept for Construction of Erectable Space Structures (ACCESS), were combined into a payload managed by the center. The EASE/ACCESS was flown aboard the Space Shuttle Mission 61-B. The EASE/ACCESS experiments were the first structures assembled in space, and the method used to manage this successful effort will be useful for future space construction missions. The MSFC mission management responsibilities for the EASE/ACCESS mission are addressed and how the lessons learned from the mission can be applied to future space construction projects are discussed. Author

N88-11399*# University of Southern Mississippi, Hattiesburg, Coll. of Science and Technology.

USING BIBLIOGRAPHIC DATABASES IN TECHNOLOGY TRANSFER

G. DAVID HUFFMAN Oct. 1987 235 p Sponsored by NASA (NASA-CR-181403; NAS 1.26:181403) Avail: NTIS HC A11/MF A01 CSCL 09B

When technology developed for a specific purpose is used in another application, the process is called technology transfer—the application of an existing technology to a new use or user for purposes other than those for which the technology was originally intended. Using Bibliographical Databases in Technology Transfer deals with demand-pull transfer, technology transfer that arises from need recognition, and is a guide for conducting demand-pull technology transfer studies. It can be used by a researcher as a self-teaching manual or by an instructor as a classroom text. A major problem of technology transfer is finding applicable technology to transfer. Described in detail is the solution to this problem, the use of computerized, bibliographic databases, which currently contain virtually all documented technology of the past 15 years. A general framework for locating technology is described. NASA technology organizations and private technology transfer firms are listed for consultation. Author

N88-11577*# National Aeronautics and Space Administration, Washington, DC.

SPINOFF, 1987

Aug. 1987 134 p (NASA-TM-89652; NAS 1.15:89652) Avail: SOD HC \$7.00 as 033-000-01008-7; NTIS MF A01 CSCL 05B

Various current or forthcoming NASA projects and experiments with potential for technology spinoff are described. NASA technological advances with existing commercial applications are outlined in the following areas: transportation; consumer; home; and recreation; medicine; resources management; energy; public safety; and manufacturing technology and industrial productivity. Specific systems, devices, and equipment are described. A concluding essay describes the NASA technology utilization/transfer effort. J.P.B.

N88-12062# Joint Publications Research Service, Arlington, VA. **JPRS REPORT: SCIENCE AND TECHNOLOGY. CHINA**

7 Aug. 1987 128 p Transl. into ENGLISH from various Chinese articles

(JPRS-CST-87-033) Avail: NTIS HC A07/MF A01

Various translated articles from Chinese books and journals are presented. All articles are generally covered under the topic of science and technology but more specifically under the topics of Aerospace, Applied Sciences, Environmental Quality, Life Sciences and Chinese National Developments.

N88-12410# National Science Foundation, Washington, DC.

NATIONAL SCIENCE FOUNDATION Annual Report, 1986

Jul. 1987 107 p (PB87-228375; NSF-87-1) Avail: NTIS HC A06/MF A01; also available SOD HC \$4.75 as 038-000-00576-6 CSCL 05A

The National Science Foundation (NSF) programs and activities for FY 1986 are described. GRA

N88-12426*# National Aeronautics and Space Administration, Washington, DC.

SPINOFF

JAMES J. HAGGERTY Aug. 1986 131 p Original contains color illustrations (NASA-TM-89651; NAS 1.15:89651) Avail: NTIS HC A07/MF A01; also available SOD HC \$6.50 as 033-000-00989-5 CSCL 05B

The major programs that generate new technology and therefore expand the bank of knowledge available for future transfer are outlined. The focal point of this volume contains a representative sampling of spinoff products and processes that resulted from technology utilization, or secondary application. The various mechanisms NASA employs to stimulate technology utilization are described and in an appendix, are listed contact sources for further information. B.G.

N88-12866# Commission of the European Communities (Luxembourg).

SOLAR ENERGY: EUROPEAN RESEARCH AND DEVELOPMENT

W. PALZ 1985 341 p (PB87-107645; EUR-9374-EN; ISBN-92-825-5307-8) Avail: NTIS HC E12/MF E12; customers in the European Community Countries should apply to the Office for Official Publications of the European Communities, B.P. 2985, Luxembourg CSCL 10A

The catalog contains two-page summaries of the results obtained in the contracts on solar energy R and D, i.e., solar radiation data, solar heating, the Eurelios solar tower power plant, photovoltaic power generation, which were concluded between the Commission of the European Communities, Directorate General for Science, Research and Development, Brussels, and a number of public and private research institutions of the European Community. GRA

N88-12915# Joint Publications Research Service, Arlington, VA. **JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES**

5 Aug. 1987 103 p Transl. into ENGLISH from various Russian articles (JPRS-ULS-87-009) Avail: NTIS HC A06/MF A01

Articles from the open literature are presented or summarized on the following topics: aerospace medicine, agricultural science, biochemistry, biotechnology, epidemiology, genetics, immunology, industrial medicine, laser bioeffects, medicine, microbiology, military medicine, nonionizing radiation effects, pharmacology and toxicology, physiology, public health, radiation biology, and virology. Recent research in the U.S.S.R. is the focus.

N88-13083*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

FY 1985 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS AND PRESENTATIONS

JOYCE E. TURNER, comp. Nov. 1985 82 p (NASA-TM-86521; NAS 1.15:86521) Avail: NTIS HC A05/MF A01 CSCL 05B

This document presents formal NASA technical reports, papers published in technical journals, and presentations by Marshall Space Flight Center (MSFC) personnel in FY 85. It also includes papers of MSFC contractors. After being announced in STAR, all of the NASA series reports may be obtained from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Va. 22161. Author

N88-14063# Office of Naval Research, London (England).

AGARD: THE NATO ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

DENNIS R. SADOWSKI 18 Aug. 1987 4 p (AD-A185062; ONRL-7-025-C) Avail: NTIS HC A02/MF A01 CSCL 05A

The AGARD origin, mission, organization, and list of AGARD Panels are presented in this brief summary of an important aerospace advisory body. GRA

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N88-14608# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES

5 Nov. 1987 74 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-87-013) Avail: NTIS HC A04/MF A01

Topics in life sciences addressed include: agricultural science; biophysics; biotechnology; epidemiology; genetics; immunology; medicine; laser bioeffects; pharmacology; toxicology; radiation effects; physiology; public health; and psychiatry.

N88-14626*# Boeing Aerospace Co., Seattle, WA.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS) PHYSIOCHEMICAL WASTE MANAGEMENT SYSTEMS EVALUATION

M. OLESON, T. SLAVIN, F. LIENING, and R. L. OLSON Jun. 1986 146 p

(Contract NAS2-11806)

(NASA-CR-177422; NAS 1.26:177422; BAC-37) Avail: NTIS HC A07/MF A01 CSCL 06K

Parametric data for six waste management subsystems considered for use on the Space Station are compared, i.e.: (1) dry incineration; (2) wet oxidation; (3) supercritical water oxidation; (4) vapor compression distillation; (5) thermoelectric integrated membrane evaporation system; and (6) vapor phase catalytic ammonia removal. The parameters selected for comparison are on-orbit weight and volume, resupply and return to Earth logistics, power consumption, and heat rejection. Trades studies are performed on subsystem parameters derived from the most recent literature. The Boeing Engineering Trade Study (BETS), an environmental control and life support system (ECLSS) trade study computer program developed by Boeing Aerospace Company, is used to properly size the subsystems under study. The six waste treatment subsystems modeled in this program are sized to process the wastes for a 90-day Space Station mission with an 8-person crew, and an emergency supply period of 28 days. The resulting subsystem parameters are compared not only on an individual subsystem level but also as part of an integrated ECLSS.

Author

N88-14671# University Coll., London (England). Dept. of Computer Science.

COMPUTER ARCHITECTURES FOR ARTIFICIAL INTELLIGENCE

P. C. TRELEAVEN, A. N. REFENES, K. J. LEES, and S. C. MCCABE Mar. 1986 122 p

(PB87-123824; UCL-CS-TR-119) Avail: NTIS HC E07/MF E07 CSCL 09B

Novel computer architectures to support Artificial Intelligence (AI) applications and AI programming languages are under development in the United States, Japan, and Europe. The AI application area having greatest influence on computer architecture is knowledge-based expert systems. Knowledge-based systems are programs that embody the specialized knowledge of human experts sufficient to perform as consultants. For programming these systems, the most suitable languages support symbolic computation. Symbolic programming languages divide into three broad classes: functional (e.g., LISP); logical (e.g., PROLOG); and what the authors refer to as Knowledge-Based languages (e.g., OPS5). GRA

N88-14846* National Aeronautics and Space Administration, Washington, DC.

UNIVERSITY PROGRAM MANAGEMENT INFORMATION SYSTEM, FISCAL YEAR 1985

1985 383 p

(NASA-TM-88381; NAS 1.15:88381) Avail: NTIS HC \$32.00 CSCL 05A

The University Program Report provides current information and related statistics for approximately 4200 grants/contracts/cooperative agreements active during the reporting period. NASA Field Centers and certain Headquarters Program Offices provide funds for those research and development

activities in universities which contribute to the mission needs of that particular NASA element. This annual report is one means of documenting the NASA-University relationship, frequently denoted, collectively, as NASA's University Program. Author

N88-14847*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

STRATEGIC MANAGEMENT OF RESEARCH AND DEVELOPMENT: A LITERATURE SEARCH

CAROL K. STERKIN, comp. 15 Jan. 1988 67 p

(NASA-CR-182337; JPL-D-5099; NAS 1.26:182337) Avail: NTIS HC A04/MF A01 CSCL 05A

Each abstract was reviewed as to its described contents and potential applicability to the topics expected to be addressed at the 1988 National Conference on strategic management of research and development. In each section the citations are listed alphabetically by senior or corporate author. The names, addresses, and telephone numbers of organizations from which the listed material may be requested, are provided. B.G.

N88-14893# Tokyo Univ. (Japan). Dept. of General Systems Studies.

IMPRESSIONS, OBSERVATIONS AND COMMENTS ON SCIENCE AND TECHNOLOGY IN JAPAN

R. S. CUTLER (National Science Foundation, Washington, D.C.) May 1987 14 p Sponsored by NSF, Washington, D.C.

(PB87-235743) Avail: NTIS HC A03/MF A01 CSCL 05A

The observations of a research scholar in Japan on how Japanese transfer scientific and technical know-how within their country are presented. Science and technology in Japan, the author's research activities in Japan, Japan's physical and economic environment, areas of excellence, research and development planning and funding, the education system, management, manners, and cooperative research are discussed.

Author

N88-14894*# National Aeronautics and Space Administration, Washington, DC.

RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS. SUMMARY, FISCAL YEAR 1986

Jan. 1986 124 p

(NASA-TM-87504; NAS 1.15:87504) Avail: NTIS HC A06/MF A01 CSCL 05A

This publication represents the NASA research and technology program for FY86. It is a compilation of the Summary portions of each of the RTOPs (Research and Technology Objectives and Plans) used for management review and control of research currently in progress throughout NASA. The RTOP summary is designed to facilitate communication and coordination among concerned technical personnel in government, industry, and universities. The first section containing citations and abstracts of the RTOPs is followed by four indexes: Subject, Technical Monitor, Responsible NASA Organization, and RTOP number. Author

N88-15354*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

MICROGRAVITY PARTICLE RESEARCH ON THE SPACE STATION

STEVEN W. SQUIRES, ed., CHRISTOPHER P. MCKAY, ed., and DEBORAH E. SCHWARTZ, ed. Dec. 1987 48 p Workshop held in Moffett Field, Calif., 22-24 Aug. 1985

(NASA-CP-2496; A-87361; NAS 1.55:2496) Avail: NTIS HC A03/MF A01 CSCL 06B

Science questions that could be addressed by a Space Station Microgravity Particle Research Facility for studying small suspended particles were discussed. Characteristics of such a facility were determined. Disciplines covered include astrophysics and the solar nebula, planetary science, atmospheric science, exobiology and life science, and physics and chemistry.

N88-15721# Environmental Protection Agency, Corvallis, OR. Environmental Research Lab.

DESIGN AND MANAGEMENT OF RESEARCH PROJECTS

T. A. MURPHY Sep. 1987 16 p
(PB88-106380; EPA/600/D-87/263) Avail: NTIS HC A03/MF
A01 CSCL 05A

Design and management of research projects is a complex task which varies widely with the people and circumstances involved. An attempt is made to distill the literature and the author's personal experience into the basic elements of project management. Thus it is subjective and selective. It also is based largely on experience within the U.S. Since management is the art of influencing human behavior, it has a significant cultural component. Some of the principles described may differ significantly under other cultural or social conditions. Finally, the discussion deals primarily with applied research in a governmental or industrial research organization rather than the more basic research typically found in academia. Author

N88-15924*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CRYOGENIC FLUID MANAGEMENT TECHNOLOGY WORKSHOP. VOLUME 1: PRESENTATION MATERIAL AND DISCUSSION

JOHN C. AYDELOTT, ed. and WILLIAM DEVOL, ed. (Sverdrup Technology, Inc., Middleburg Heights, Ohio.) Sep. 1987 386 p
Workshop held in Cleveland, Ohio, 28-30 Apr. 1987
(NASA-CP-10001; E-3732; NAS 1.55:10001) Avail: NTIS HC
A17/MF A01 CSCL 20D

The major objective of the workshop was to identify future NASA needs for technology that will allow the management of subcritical cryogenic fluids in the low gravity space environment. Workshop participants were asked to identify those technologies which will require in-space experimentation and are thus candidates for inclusion in the flight experiment being defined at the Lewis Research Center.

N88-16281*# National Academy of Sciences - National Research Council, Washington, DC.

INTERNATIONAL ROLE OF US GEOSCIENCE Final Report
Jun. 1987 104 p Sponsored in part by NASA; National Geodetic Survey, Rockville, Md.
(Contract NA84-AA-D-00009)
(NASA-CR-182407; NAS 1.26:182407; PB88-113683) Avail:
NTIS HC A06/MF A01 CSCL 08G

Geologic processes are global in scope and no country or continent has areas that encompass all the phenomena. Joint participation between U.S. and foreign scientists is indispensable for advancing basic scientific concepts and their application to economic and policy issues in the U.S. Up-to-date knowledge is critical to assure an adequate flow of industrial minerals and to assure an adequate supply of strategic minerals. GRA

N88-16317*# Lockheed Engineering and Management Services Co., Inc., Washington, DC.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 14
LYDIA RAZRAN HOOKE, RONALD TEETER, MIKE RADTKE, and JOSEPH ROWE (Library of Congress, Washington, D. C.)
Washington, D.C. NASA Feb. 1988 110 p
(Contract NASW-4292)
(NASA-CR-3922(16); NAS 1.26:3922(16)) Avail: NTIS HC
A06/MF A01 CSCL 06B

This is the fourteenth issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 32 papers recently published in Russian language periodicals and bound collections and of three new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. Also included is a review of a recent Soviet conference on Space Biology and Aerospace Medicine. Current Soviet life sciences titles available in English are cited. The materials included in this issue have been identified as relevant to the following areas of aerospace medicine and space biology: adaptation, biological rhythms, body fluids, botany, cardiovascular and respiratory systems, developmental biology, endocrinology, enzymology, equipment and instrumentation, gastrointestinal systems, habitability and environment effects, human performance, immunology, life support

systems, mathematical modeling, metabolism, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, and space biology and medicine. Author

N88-16318# Joint Publications Research Service, Arlington, VA.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES

5 Dec. 1986 121 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-022) Avail: NTIS HC A06/MF A01

Articles from the open literature are summarized in the areas of aerospace medicine, agrotechnology, biochemistry, biophysics, biotechnology, environment, epidemiology, genetics, immunology, laser bioeffects, marine mammals, medicine, microbiology, military medicine, molecular biology, pharmacology and toxicology, physiology, public health, radiation biology, veterinary medicine, and psychiatric conferences.

N88-16417*# Auburn Univ., AL. Dept. of Computer Science and Engineering.

PLANNING ACTIVITIES IN SPACE

KAI-HSIUNG CHANG *In* NASA. Marshall Space Flight Center, Third Conference on Artificial Intelligence for Space Applications, Part 1 p 315-319 Nov. 1987

Avail: NTIS HC A18/MF A01 CSCL 09B

Three aspects of planning activities in space are presented. These include generating plans efficiently, coordinating actions among multiple agents, and recovering from plan execution errors. Each aspect is discussed separately. Author

N88-16720# European Space Agency, Paris (France). Dept. of Future Scientific Programs.

STUDIES FOR FUTURE SCIENTIFIC PROJECTS

E. PEYTREMANN *In its* ESA Bulletin No. 8 p 8-12 Feb. 1977
Avail: NTIS HC A05/MF A01

A Sun-Earth Observatory and Climatology Satellite, (SECOCS) a Grazing-Incidence Solar Telescope (GRIST) for Spacelab, an Extreme Ultraviolet and X-Ray Survey Satellite (EXUV), and a Space Astronomy mission are discussed. The projects are alternatives to the Space Telescope and Out-of-Ecliptic missions, joint NASA-ESA projects which await approval by U.S. authorities. Smaller projects (solar probe, dumb bell configuration, transient X-ray sources, IR satellite, Spacelab superconducting magnetic facility, and life sciences) are mentioned. Author (ESA)

N88-17205*# National Aeronautics and Space Administration, Washington, DC.

PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1986: A SPECIAL BIBLIOGRAPHY

Mar. 1988 57 p Prepared in cooperation with George Washington Univ., Washington, D.C.
(Contract NASW-3165)
(NASA-TM-4029; NAS 1.15:4029) Avail: NTIS HC A04/MF A01
CSCL 06B

A list of 1986 publications resulting from research pursued under the auspices of NASA's Exobiology Program is contained. Research supported by the program is explored in the areas of cosmic evolution of biogenic compounds, prebiotic evolution, early evolution of life, and evolution of advanced life. Preemption and preproject activities supporting these areas are supported in the areas of solar system exploration and search for extraterrestrial intelligence. Author

N88-17577*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

RESEARCH AND TECHNOLOGY 1987 Annual Report

Dec. 1987 154 p
(NASA-TM-4021; L-16381; NAS 1.15:4021) Avail: NTIS HC
A08/MF A01 CSCL 05D

The mission of the NASA Langley Research Center is to increase the knowledge and capability of the United States in a full range of aeronautics disciplines and in selected space

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disciplines. This mission will be accomplished by: performing innovative research relevant to national needs and Agency goals; transferring technology to users in a timely manner; and providing development support to other United States Government agencies, industry, and other NASA centers. Contained are highlights of the major accomplishments and applications that were made during the past year. The highlights illustrate both the broad range of the research and technology activities at the NASA Langley Research Center and the contributions of this work toward maintaining United States leadership in aeronautics and space research.
Author

N88-17691*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

THE 1987 GET AWAY SPECIAL EXPERIMENTER'S SYMPOSIUM

NEAL BARTHELME, ed. and FRANCES L. MOSIER, ed. (RMS Technologies, Inc., Landover, Md.) Feb. 1988 169 p Symposium held in Greenbelt, Md., 27-28 Oct. 1987 (NASA-CP-2500; REPT-88B0049; NAS 1.55:2500) Avail: NTIS HC A08/MF A01 CSCL 22A

The 1987 Get Away Special (GAS) Experimenter's symposium provides a formal opportunity for GAS Experimenter's to share the results of their projects. The focus of this symposium was on payloads that were flown on Shuttle missions, and on GAS payloads that will be flown in the future.

N88-17711*# Federal Aviation Administration, Washington, DC. **LIGHTSATS AND THEIR ATTRACTION TO BUDGET ORIENTED FEDERAL AGENCIES**

CHARLES A. BONSALL *In* NASA. Goddard Space Flight Center, The 1987 Get Away Special Experimenter's Symposium p 141-146 Feb. 1988

Avail: NTIS HC A08/MF A01 CSCL 22B

The term Lightsats refers to low volume, low mass, low Earth orbit, satellites suitable for launch from Get Away Special canisters, or as secondary payloads on expendable launch vehicles. New or existing technology that offers potential to improve the safety, capacity and efficiency of the National Airspace System is discussed. The discussion is presented from the point of view of an individual within a government agency who wants to see a new technology to enhance the mission of that agency. Author

N88-17725*# National Aeronautics and Space Administration, Washington, DC.

AXAF: THE ADVANCED X-RAY ASTROPHYSICS FACILITY

1988 40 p Original contains color illustrations (NASA-EP-251(M); NAS 1.19:251(M)) Avail: SOD HC \$2.50 as 033-000-00904-6; NTIS MF A01 CSCL 22B

The Advanced X-ray Astrophysics Facility (AXAF) will be the X-ray astronomy component of U.S. space exploration via Great Observatories (mostly orbital) for the remainder of the century. AXAF and the research planned for it are discussed for a lay audience.
J.P.B.

N88-17761*# National Academy of Sciences - National Research Council, Washington, DC.

EARTH MATERIALS RESEARCH: REPORT OF A WORKSHOP ON PHYSICS AND CHEMISTRY OF EARTH MATERIALS

1987 134 p Sponsored in part by DOE, Washington, D.C. and by Geological Survey, Reston, Va. (Contract DE-FG01-82ER-12018; DI-14-08-0001-G-1124; NSF EAR-85-18789)

(NASA-CR-182519; NAS 1.26:182519; PB88-131594) Avail: NTIS HC A07/MF A01 CSCL 07D

The report concludes that an enhanced effort of earth materials research is necessary to advance the understanding of the processes that shape the planet. In support of such an effort, there are new classes of experiments, new levels of analytical sensitivity and precision, and new levels of theory that are now applicable in understanding the physical and chemical properties of geological materials. The application of these capabilities involves the need to upgrade and make greater use of existing

facilities as well as the development of new techniques. A concomitant need is for a sample program involving their collection, synthesis, distribution, and analysis.
GRA

N88-18150# Joint Publications Research Service, Arlington, VA. **JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 21, NO. 6, NOVEMBER - DECEMBER 1987**

O. G. GAZENKO, ed. 11 Mar. 1988 149 p Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 6, Nov. - Dec. 1987 95 p (JPRS-USB-88-004) Avail: NTIS HC A07/MF A01

Topics addressed include: aerospace medicine; electrocardiography; human tolerance to acceleration; effects of weightlessness on rats; effect of oxygen inhalation on respiratory function; cardiorespiratory parameters; hemodynamics; and space flight stress.

N88-18174*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

NASA WORKSHOP ON BIOLOGICAL ADAPTATION

EMILY MOREY-HOLTON, ed. and MARC TISCHLER, ed. (Arizona Univ., Tucson.) Feb. 1988 105 p Workshop held 28-30 Apr. 1986

(NASA-TM-89468; A-87248; NAS 1.15:89468) Avail: NTIS HC A06/MF A01 CSCL 06B

A workshop was convened to review the current program in Space Biology Biological Adaptation Research and its objectives and to identify future research directions. Two research areas emerged from these deliberations: gravitational effects on structures and biomineralization and gravity affected regulatory mechanisms. The participants also recommended that research concentrate on rapidly growing animals, since gravity effects may be more pronounced during growth and development. Both research areas were defined and future research directions were identified. The recommendations of the workshop will assist the Life Sciences Division of NASA in its assessment and long-range planning of these areas of space biology. Equally important, the workshop was intended to stimulate thought and research among those attending so that they would, in turn, interest, excite, and involve other members of the academic community in research efforts relevant to these programs.
Author

N88-18175*# Lockheed Engineering and Management Services Co., Inc., Washington, DC.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 15

LYDIA RAZRAN HOOKE, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, D. C.) Mar. 1988 120 p (Contract NASW-4292)

(NASA-CR-3922(18); NAS 1.26:3922(18)) Avail: NTIS HC A06/MF A01 CSCL 06B

This is the 15th issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 59 papers published in Russian language periodicals or presented at conferences and of two new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. An additional feature is a review of a conference devoted to the physiology of extreme states. The abstracts included in this issue have been identified as relevant to 29 areas of space biology and medicine. These areas are adaptation, biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, endocrinology, enzymology, equipment and instrumentation, exobiology, genetics, habitability and environment effects, human performance, immunology, life support systems, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, reproductive biology, and space biology and medicine.
Author

N88-18333# National Academy of Sciences - National Research Council, Washington, DC.

INTERDISCIPLINARY RESEARCH IN MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION

1987 98 p

(Contract NSF SPE-84-70489)

(PB88-131446) Avail: NTIS HC A05/MF A01 CSCL 12A

The role of interdisciplinary research is discussed, as well as research needs in science and mathematics education, experience with interdisciplinary research, and research program alternatives.

GRA

N88-18504# Massachusetts Inst. of Tech., Cambridge. Energy Lab.

A COLLABORATIVE PROGRAM OF RESEARCH IN ENGINEERING SCIENCES

Mar. 1987 458 p Prepared in cooperation with Idaho National Engineering Lab., Idaho Falls

(Contract DE-FG02-85ER-13331; DE-AC06-87RL-10930)

(DE88-003383; DOE/ER-13331/1) Avail: NTIS HC A20/MF A01

This proposal describes a collaborative program of energy-related engineering research. The proposal builds upon, and extends, research begun in 1985. Research areas in the initial program were: thermal plasmas; automated welding; engineering analyses and design; and solid mechanics. Work in these areas will continue. New projects are proposed in the area of sensors and diagnostics. Each organization, MIT and Idaho National Engineering Laboratory (INEL), will conduct research in each of the areas. The research projects are coordinated between institutions and are designed to enhance the productivity of the program by exploiting the separate strengths of each organization. The MIT segment of the program involves 18 faculty members, 8 professional staff members, and 31 graduate research assistants. The program is planned for a 5-year duration.

DOE

N88-18548*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.

RESEARCH AND TECHNOLOGY 1987 ANNUAL REPORT OF THE KENNEDY SPACE CENTER

Dec. 1987 72 p

(NASA-TM-100303; NAS 1.15:100303) Avail: NTIS HC A04/MF A01 CSCL 05D

As the NASA Center responsible for assembly, checkout, servicing, launch, recovery, and operational support of Space Transportation System elements and payloads, Kennedy Space Center is placing increasing emphasis on the Center's research and technology program. In addition to strengthening those areas of engineering and operations technology that contribute to safer, more efficient, and more economical execution of our current mission, we are developing the technological tools needed to execute the Center's mission relative to future programs. The Engineering Development Directorate encompasses most of the laboratories and other Center resources that are key elements of research and technology program implementation, and is responsible for implementation of the majority of the projects of this Kennedy Space Center 1987 Annual Report.

Author

N88-19066*# National Aeronautics and Space Administration, Washington, DC.

GENETIC RESEARCH IN SPACE

N. L. DELONE, V. V. ANTIPOV, and YE. A. ILYIN Mar. 1988

10 p Transl. into ENGLISH of Geneticheskoye Issledovaniya v Kosmose (Moscow, USSR), Inst. for Medical-Biological Problems, Ministry of Health USSR, Scientific Council, 1987 p 1-11 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASW-4307)

(NASA-TT-20216; NAS 1.77:20216) Avail: NTIS HC A02/MF

A01 CSCL 06B

The role of the genetic apparatus in the adaptation of the organism to conditions of weightlessness is studied. The investigation includes studies at the gene, chromosome, cell, tissue, and organism levels, as well as studies at the population level.

Author

N88-19079# Joint Publications Research Service, Arlington, VA. JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES

12 Feb. 1988 65 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-88-001) Avail: NTIS HC A04/MF A01

Articles and summaries of articles from the open literature are presented in the areas of aerospace medicine, agricultural science, biochemistry, biotechnology, epidemiology, genetics, laser bioeffects, microbiology, molecular biology, pharmacology and toxicology, physiology, public health, radiation biology, and virology.

N88-19283# Office of Technology Assessment, Washington, DC.

STARPOWER: THE US AND THE INTERNATIONAL QUEST FOR FUSION ENERGY

Oct. 1987 247 p

(PB88-128731; OTA-E-338; LC-87-619854) Avail: NTIS HC

A11/MF A01; also available SOD HC \$10.00 as

052-003-010-79-8 CSCL 20I

The status of magnetic confinement fusion research is reviewed and compared with the requirements for development of a useful energy technology. Inertial confinement fusion research is not analyzed. Some topics covered are: history of fusion research; fusion science and technology; fusion as an energy program; fusion as a research program; fusion as an international program; and future paths for the magnetic fusion program. Appendixes include: nonelectric applications for fusion; other approaches to fusion; data for figures; etc.

Author

N88-19375*# National Aeronautics and Space Administration, Washington, DC.

SPACELAB: AN INTERNATIONAL SUCCESS STORY

DOUGLAS R. LORD (Science Applications International Corp., Washington, D.C.) 1987 565 p Original contains color illustrations

(Contract NASW-4092)

(NASA-SP-487; NAS 1.21:487; LC-86-17979) Avail: NTIS HC

A24/MF A01 CSCL 05D

Spacelab is a European-developed and U.S.-operated space laboratory carried in the cargo bay of the Space Shuttle Orbiter. This story of the Spacelab Development Program traces the program from the origin of the Spacelab concept, describing negotiations and agreements for European participation and the role of Europe and the United States in system development, operational capability development, and utilization planning. It also considers the joint management structure, coordination, and experience in solving management and technical interface problems. The book is not an exhaustive historical treatise, but an informative and readable story of the evolution and technical accomplishments of this unique program in manned space flight and of some of the unusual political and human interest aspects of the program from the viewpoint of one of the key participants.

Author

N88-19382# Lawrence Livermore National Lab., CA.

A STUDY OF TECHNOLOGY TRANSFER ARRANGEMENTS FOR NATIONAL LABORATORIES

R. C. DORF and K. K. F. WORTHINGTON 25 Aug. 1987 103 p

(Contract W-7405-ENG-48)

(DE88-005423; UCRL-15967) Avail: NTIS HC A06

The transfer of technology to industrial partners and users is a complex task. The interactions between federal laboratories and industry and the market knowledge and ability to assess the needs of business users are beyond the charter of a federal laboratory. Therefore, new organizational mechanisms are required in order to obtain full commercial value from the laboratories' efforts. This paper will analyze cases of new ventures emerging from technology developed within federal laboratories. Seven models will be identified for technology transfer. These are the Information Dissemination Model, the Licensing Model, the Venture Capital

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Model, the Large Company-Joint Venture Model, the Incubator-Science Park Model, the Ferret Model, and the Agriculture Extension Model. Out of 13 laboratories, a Lawrence Livermore National Laboratory Partnership will be identified as having the greatest potential for successful implementation. The arrangement is a proposed consortium of the Lawrence Livermore National Laboratory, the University of California, venture capitalists, industrial firms, and federal and state agencies. DOE

N88-20225*# LFW Management Associates, Inc., Alexandria, VA.

DEVELOPMENT OF A NATIONWIDE NETWORK FOR TECHNOLOGY TRANSFER Annual Report

LOUIS B. C. FONG and PAUL R. BROCKMAN 30 Jun. 1987 27 p

(Contract NASW-4128)

(NASA-CR-181058; NAS 1.26:181058) Avail: NTIS HC A03/MF A01 CSCL 05A

The winter and spring of 1987 saw the cooperative nationwide network for technology transfer translated from concept to reality. The most obvious of the network relationships which were developed or which are anticipated are summarized. The objective was to help assure that every U.S. business which has the capacity to exploit, or the need to obtain new technology in any form, has access to the technology it needs or can use. B.G.

N88-20228# National Academy of Sciences - National Research Council, Washington, DC. Commission on Engineering and Technical Systems.

TECHNOLOGY TRANSFER FROM US FEDERAL LABORATORIES: REPORT OF A ROUNDTABLE Final Report

J. W. LYONS Oct. 1987 9 p Meeting held in Washington, D.C., 10 Jun. 1987

(PB88-144803) Avail: NTIS HC A02/MF A01 CSCL 05A

In response to a request from the Office of Science and Technology Policy of the Executive Office of the President, the National Council invited a group of industrial research managers and Federal laboratory representatives to an all-day discussion of problems with, and opportunities for, cooperation between industrial firms, and Federal laboratories, with the aim of benefitting American industry and, ultimately, the U.S. economy as a whole. The meeting was held on June 10, 1987, at the National Academy of Sciences in Washington, D.C. Points made: transferring technology from the Federal laboratories is easier now than it was 20 years ago; Federal laboratories are more willing to facilitate such transfers; Federal laboratory and industry cultures do not match perfectly, but there is a high level of goodwill between them; and obstacles remain, especially in obtaining approvals for the formal transfer of technology elements, such as patent rights. GRA

N88-20253*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

RESEARCH AND TECHNOLOGY, 1987 Annual Report

Dec. 1987 143 p

(NASA-TM-100323; NAS 1.15:100323) Avail: NTIS HC A07/MF A01 CSCL 05A

Three broad goals were presented by NASA as a guide to meet the challenges of the future: to advance scientific knowledge of the planet Earth, the solar system, and the universe; to expand human presence beyond the Earth into the solar system; and to strengthen aeronautics research and technology. Near-term and new-generation space transportation and propulsion systems are being analyzed that will assure the nation access to and presence in space. Other key advanced studies include large astronomical observatories, space platforms, scientific and commercial payloads, and systems to enhance operations in Earth orbit. Longer-range studies include systems that would allow humans to explore the Moon and Mars during the next century. Research programs, both to support the many space missions studied or managed by the Center and to advance scientific knowledge in selected areas, involve work in the areas of atmospheric science, earth science, space science (including astrophysics and solar, magnetospheric, and atomic physics), and low-gravity science. Programs and

experiment design for flights on the Space Station, free-flying satellites, and the Space Shuttle are being planned. To maintain a leadership position in technology, continued advances in liquid and solid propellant engines, materials and processes; electronic, structural, and thermal investigations; and environmental control are required. Progress during the fiscal year 1987 is discussed. B.G.

N88-20524*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE DEEP SPACE NETWORK

Jan. 1988 25 p

(NASA-CR-182700; JPL-400-333; NAS 1.26:182700) Avail: NTIS HC A03/MF A01 CSCL 17B

The Deep Space Network (DSN) is the largest and most sensitive scientific telecommunications and radio navigation network in the world. Its principal responsibilities are to support unmanned interplanetary spacecraft missions and to support radio and radar astronomy observations in the exploration of the solar system and the universe. The DSN facilities and capabilities as of January 1988 are described. B.G.

N88-20599*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

CRYOGENIC FLUID MANAGEMENT TECHNOLOGY WORKSHOP. VOLUME 2: ROUNDTABLE DISCUSSION OF TECHNOLOGY REQUIREMENTS

Mar. 1988 84 p Workshop held in Cleveland, Ohio, 28-30 Apr. 1987

(NASA-CP-10009; E-3987; NAS 1.55:10009) Avail: NTIS HC A05/MF A01 CSCL 20D

The Cryogenic Fluid Management Technology Workshop was held April 28 to 30, 1987, at the NASA Lewis Research Center in Cleveland, Ohio. The major objective of the workshop was to identify future NASA needs for technology concerning the management of subcritical cryogenic fluids in the low-gravity space environment. In addition, workshop participants were asked to identify those technologies which will require in-space experimentation and thus are candidates for inclusion in the flight experiment being defined at Lewis. The principal application for advanced fluid management technology is the Space-Based Orbit Transfer Vehicle (SBOTV) and its servicing facility, the On-Orbit Cryogenic Fuel Depot (OOCFD). Other potential applications include the replenishment of cryogenic coolants (with the exception of superfluid helium), reactants, and propellants on board a variety of spacecraft including the space station and space-based weapon systems. The last day was devoted to a roundtable discussion of cryogenic fluid management technology requirements by 30 representatives from NASA, industry, and academia. This volume contains a transcript of the discussion of the eight major technology categories. Author

N88-21076*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

JOHNSON SPACE CENTER'S STRATEGIC GAME PLAN:

CHARTING A COURSE TO THE YEAR 2000 AND BEYOND

Oct. 1987 45 p

(NASA-TM-89733; NAS 1.15:89733) Avail: NTIS HC A03/MF A01 CSCL 05A

The Johnson Space Center has established five major goals to meet the Nation's expectation of maintaining U.S. preeminence in space. The first three are technical in nature. They define the basic mission-the reason for being. The two goals relating to the Space Shuttle and Space Station are obviously the most demanding in their immediate claim for major resources. The third goal is equally important in that the technical competence must be maintained and enhanced. The remaining two goals address the two critical success factors required for achieving the first three. One goal pertains to maintaining and enhancing the highly skilled work force. The other goal concerns the important relations with other key members of the U.S. space team. Each goal is listed along with a proposed strategy or approach for implementing each goal. Subsequently, each goal is accompanied by a brief

explanation and a set of objectives. These objectives provide the specific targets of opportunity for focusing the immediate efforts.

B.G.

N88-21084# Department of Energy, Washington, DC.
**TECHNOLOGY '87: RESEARCH AND DEVELOPMENT
LABORATORY TECHNOLOGY TRANSFER PROGRAM Annual
Report**

Jan. 1988 113 p

(DE88-003142; DOE/ER-0355) Avail: NTIS HC A06/MF A01

An overview of technology transfer of U.S. Department of Energy's National Laboratories is presented. Areas specifically presented are: Materials Science and Manufacturing; Analysis and Instrumentation; Energy Technology; Environment and Waste Management; Biology and Medicine; and Computers and Communication. Specific research accomplishments are discussed.

DOE

N88-21254*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, OH.
**POWER SYSTEMS FOR PRODUCTION, CONSTRUCTION, LIFE
SUPPORT AND OPERATIONS IN SPACE**

RONALD J. SOVIE 1988 16 p Proposed for presentation at
Space '88, Albuquerque, N. Mex., 29-31 Aug. 1988; sponsored by
the American Society of Civil Engineers

(NASA-TM-100838; E-4026; NAS 1.15:100838) Avail: NTIS HC
A03/MF A01 CSCL 22B

As one looks to man's future in space it becomes obvious that unprecedented amounts of power are required for the exploration, colonization, and exploitation of space. Activities envisioned include interplanetary travel and LEO to GEO transport using electric propulsion, Earth and lunar observatories, advance space stations, free-flying manufacturing platforms, communications platforms, and eventually evolutionary lunar and Mars bases. These latter bases would start as camps with modest power requirements (kWes) and evolve to large bases as manufacturing, food production, and life support materials are developed from lunar raw materials. These latter activities require very robust power supplies (MWes). The advanced power system technologies being pursued by NASA to fulfill these future needs are described. Technologies discussed will include nuclear, photovoltaic, and solar dynamic space power systems, including energy storage, power conditioning, power transmission, and thermal management. The state-of-the-art and gains to be made by technology advancements will be discussed. Mission requirements for a variety of applications (LEO, GEO, lunar, and Martian) will be treated, and data for power systems ranging from a few kilowatts to megawatt power systems will be represented. In addition the space power technologies being initiated under NASA's new Civilian Space Technology Initiative (CSTI) and Space Leadership Planning Group Activities will be discussed.

Author

N88-21866# Office National d'Etudes et de Recherches
Aerospaciales, Paris (France).
ACTIVITIES REPORT IN AEROSPACE Annual Report, 1986

Jun. 1987 19 p

(ETN-88-91978) Avail: NTIS HC A03/MF A01

Aerospace research management and organization are described, and patents are listed.

ESA

N88-21872# Office of Technology Assessment, Washington,
DC.
**TECHNOLOGY TRANSFER TO CHINA. VOLUME 2: WORKING
PAPERS, PART 1**

ALBERT KEIDEL, ROBERT BRUCE, D. F. SIMON, J. MCLUCAS,
and D. G. BLAINE Nov. 1987 472 p

(PB88-158704) Avail: NTIS HC A20/MF A01 CSCL 05A

The contents of this report on technology transfer to China (Volume 2) are as follows: The role of technology transfer for China's economic future; China's evolving computer industry; the role of foreign technology transfers; satellite telecommunications

technology transfer to China; and, railroads of the People's Republic of China.

GRA

N88-21873# Office of Technology Assessment, Washington,
DC.

**TECHNOLOGY TRANSFER TO CHINA. VOLUME 2: WORKING
PAPERS, PART 2**

W. A. FISCHER, A. CRANE, T. FINGAR, T. W. ROBINSON, and
R. F. GROW Nov. 1987 400 p

(PB88-158712) Avail: NTIS HC A17/MF A01 CSCL 05A

The contents of this report on Technology Transfer to China are as follows: The transfer of western managerial knowledge to China; national security risks of dual-use transfers to China; politics, policy and China's future course; China's foreign policy, Beijing's military modernization and American policy alternatives; American firms and the transfer of technology to China; and, how business people view the process.

GRA

N88-22218# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. JAPAN

3 Mar. 1988 91 p Transl. into ENGLISH from various Japanese
articles

(JPRS-JST-88-001) Avail: NTIS HC A05/MF A01

Topics addressed include: civil aviation, aerospace engineering, advanced materials, computers, biotechnology, defense industries, science and technology policy, nuclear developments, and microelectronics.

N88-22228# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. JAPAN

27 Oct. 1987 128 p Transl. into ENGLISH from various Japanese
articles

(JPRS-JST-87-029) Avail: NTIS HC A07/MF A01

Topics addressed include: computers; advanced materials; civil aviation; aerospace engineering; energy technology; defense industries; laser applications; optics; and science and technology policy.

N88-22446*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, OH.

**STRUCTURAL DYNAMICS BRANCH RESEARCH AND
ACCOMPLISHMENTS FOR FISCAL YEAR 1987**

May 1988 34 p

(NASA-TM-100279; E-3920; NAS 1.15:100279) Avail: NTIS HC
A03/MF A01 CSCL 20K

This publication contains a collection of fiscal year 1987 research highlights from the Structural Dynamics Branch at NASA Lewis Research Center. Highlights from the branch's four major work areas, Aeroelasticity, Vibration Control, Dynamic Systems, and Computational Structural Methods, are included in the report as well as a complete listing of the FY87 branch publications.

Author

N88-22515*# Lockheed Engineering and Management Services
Co., Inc., Washington, DC.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 16

LYDIA RAZRAN HOOKE, ed., RONALD TEETER, ed., BETTE
SIEGEL, ed., P. LYNN DONALDSON, ed., LAUREN B. LEVETON,
ed., and JOSEPH ROWE, ed. (Library of Congress, Washington,
D. C.) Apr. 1988 124 p

(Contract NASW-4292)

(NASA-CR-3922(19); NAS 1.26:3922(19)) Avail: NTIS HC
A06/MF A01 CSCL 06C

This is the sixteenth issue of NASA's USSR Life Sciences Digest. It contains abstracts of 57 papers published in Russian language periodicals or presented at conferences and of 2 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. An additional feature is the review of a book concerned with metabolic response to the stress of space flight. The abstracts included in this issue are relevant to 33 areas of space biology and medicine. These areas are: adaptation, biological rhythms, bionics, biospherics, body fluids, botany, cardiovascular and respiratory systems, developmental biology,

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endocrinology, enzymology, exobiology, gastrointestinal system, genetics, gravitational biology, habitability and environmental effects, hematology, human performance, immunology, life support systems, man-machine systems, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, reproductive biology, and space biology. Author

N88-22830*# National Aeronautics and Space Administration, Washington, DC.

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS: A CATALOG OF SPECIAL PUBLICATIONS, REFERENCE PUBLICATIONS, CONFERENCE PUBLICATIONS, AND TECHNICAL PAPERS, 1987

Mar. 1988 69 p
(NASA-SP-7063(02); NAS 1.21:7063(02)) Avail: NTIS HC free as PR-828; NASA Scientific and Technical Information Facility, P.O. Box 8757, BWI Airport, Md. 21240 HC free CSCL 05B

This catalog lists 239 citations of all NASA Special Publications, NASA Reference Publications, NASA Conference Publications, and NASA Technical Papers that were entered in the NASA scientific and technical information database during accession year 1987. The entries are grouped by subject category. Indexes of subject terms, personal authors, and NASA report numbers are provided. Author

N88-22851*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

RESEARCH AND TECHNOLOGY Annual Report, 1987

1987 103 p
(NASA-TM-100172; E-3740; NAS 1.15:100172) Avail: NTIS HC A06/MF A01 CSCL 05A

The NASA Lewis Research Center's research and technology accomplishments for fiscal year 1987 are summarized. It comprises approximately 100 short articles submitted by staff members of the technical directorates and is organized into four sections: aeronautics, aerospace technology (which includes space communications), space station systems, and computational support. A table of contents by subject was developed to assist the reader in finding articles of special interest. Author

N88-22852*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

MARSHALL SPACE FLIGHT CENTER 1960-1985: 25TH ANNIVERSARY REPORT

Jul. 1985 98 p Original contains color illustrations
(NASA-TM-100328; NAS 1.15:100328) Avail: NTIS HC A05/MF A01; also available SOD HC \$6.00 as 033-000-00965-8 CSCL 05D

The Marshall Space Flight Center marks its 25th anniversary with a record of notable achievements. These accomplishments are the essence of the Marshall Center's history. Behind the scenes of the space launches and missions, however, lies the story of challenges faced and problems solved. The highlights of that story are presented. The story is organized not as a straight chronology but as three parallel reviews of the major assignments: propulsion systems and launch vehicles, space science research and technology, and manned space systems. The general goals were to reach space, to know and understand the space environment, and to inhabit and utilize space for the benefit of mankind. Also included is a chronology of major events, presented as a fold-out chart for ready reference. Author

N88-22853*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

LANGLEY AEROSPACE TEST HIGHLIGHTS, 1987

May 1988 114 p
(NASA-TM-100595; NAS 1.15:100595) Avail: NTIS HC A06/MF A01 CSCL 05D

The role of the Langley Research Center is to perform basic and applied research necessary for the advancement of aeronautics and space flight, to generate new and advanced concepts for the

accomplishment of related national goals, and to provide research advice, technological support, and assistance to other NASA installations, other government agencies, and industry. Some of the significant tests which were performed during the calendar year 1987 in Langley test facilities are illustrated. Both the broad range of the research and technology activities at Langley and the contributions of this work toward maintaining the U.S. leadership in aeronautics and space research are illustrated. Author

N88-22854*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

SPACE DIRECTORATE RESEARCH AND TECHNOLOGY ACCOMPLISHMENTS FOR FISCAL YEAR 1987

DON E. AVERY May 1988 164 p
(NASA-TM-100607; NAS 1.15:100607) Avail: NTIS HC A08/MF A01 CSCL 05D

The major accomplishments and test highlights of the Space Directorate of NASA Langley Research Center for FY87 are presented. Accomplishments and test highlights are listed by Division and Branch. This information should be useful in coordinating programs with government organizations, universities, and industry in areas of mutual interest. Author

N88-23715*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

JOINT UNIVERSITY PROGRAM FOR AIR TRANSPORTATION RESEARCH, 1986

FREDERICK R. MORRELL, comp. Apr. 1988 115 p Meeting held in Hampton, Va., 8-9 Jan. 1987; sponsored by NASA, Langley Research Center, Hampton, Va. and FAA, Washington, D.C. Sponsored by NASA, Washington
(NASA-CP-2502; L-16406; NAS 1.55:2502) Avail: NTIS HC A06/MF A01 CSCL 01B

The research conducted under the NASA/FAA sponsored Joint University Program for Air Transportation Research is summarized. The Joint University Program is a coordinated set of three grants sponsored by NASA and the FAA, one each with the Mass. Inst. of Tech., Ohio Univ., and Princeton Univ. Completed works, status reports, and bibliographies are presented for research topics, which include computer science, guidance and control theory and practice, aircraft performance, flight dynamics, and applied experimental psychology. An overview of activities is presented.

N88-23814# European Space Agency, Paris (France).

PREPARING FOR THE NEW PROGRAMS. THE ESA TECHNOLOGICAL RESEARCH AND DEVELOPMENT PROGRAM 1988-1990

NORMAN LONGDON, ed. Dec. 1987 209 p Original contains color illustrations
(ESA-SP-1095; TD(88)1; ETN-88-92557) Avail: NTIS HC A10/MF A01

The European Space Agency's R and D activities in Earth-space telematics; space communications infrastructure; global Earth monitoring; deep space and observatory facilities; microgravity utilization; manned systems and platforms; in-orbit operations and servicing; launcher and reentry technology; and common and genetic technology are outlined. ESA

N88-24000*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

STRUCTURES AND DYNAMICS DIVISION RESEARCH AND TECHNOLOGY PLANS FOR FY 1988 AND ACCOMPLISHMENTS FOR FY 1987

KAY S. BALES May 1988 94 p
(NASA-TM-100585; NAS 1.15:100585) Avail: NTIS HC A05/MF A01 CSCL 20K

Presented are the Objectives, FY 1988 Plans, Approach, and FY 1988 Milestones for the Structures and Dynamics Division (Langley Research Center) research programs. FY 1987 Accomplishments are presented where applicable. This information is useful in program coordination with other governmental organizations in areas of mutual interest. Author

N88-24108# Science Applications International Corp., McLean, VA.

SOVIET REMOTE SENSING RESEARCH AND TECHNOLOGY

P. N. SLATER, R. R. P. CHASE, R. S. FRASER, F. E. HOGE, J. C. PRICE, and G. J. ZISSIS Feb. 1988 226 p (FASAC-TAR-3130) Avail: NTIS HC A11/MF A01

This review of Soviet civilian remote sensing research and technology is based mainly on literature published by Soviet scientists and to a much smaller extent on information contained in Soviet press releases and elsewhere. An overall assessment of Soviet research and technology in remote sensing is provided. The sensors, methodologies, and results of the Soviet remote sensing program in the solar reflective, thermal infrared, and microwave regions of the electromagnetic spectrum are examined. Also discussed is the Soviet work in data handling and information extraction. The general conclusion is that the United States leads the Soviet Union by about five years in most areas of remote sensing research and technology. This lead is mainly the result of the superior microelectronics technology and computing capability of the United States, particularly with regard to the telemetry and processing of large quantities of high-quality, satellite-acquired, digital image data—the starting point for most Western research and application studies in remote sensing. Author

N88-24155* Lockheed Engineering and Management Services Co., Inc., Washington, DC.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 17

LYDIA RAZRAN HOOKE, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, D. C.) Washington NASA Jun. 1988 126 p (Contract NASW-4292)

(NASA-CR-3922(20); NAS 1.26:3922(20)) Avail: Issuing Activity CSCL 06C

This is the seventeenth issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 62 papers published in Russian language periodicals or presented at conferences and of 3 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. The abstracts included in this issue have been identified as relevant to 33 areas of space biology and medicine. These areas are: adaptation, biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, cytology, cosmonaut training, developmental biology, endocrinology, enzymology, equipment and instrumentation, exobiology, gastrointestinal system, genetics, habitability and environmental effects, hematology, human performance, immunology, life support systems, man-machine systems, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, and reproductive biology. Author

N88-24254# New Mexico Univ., Albuquerque. Dept. of Chemical and Nuclear Engineering.

TRANSACTIONS OF THE FOURTH SYMPOSIUM ON SPACE NUCLEAR POWER SYSTEMS

MOHAMED S. EL-GENK, ed. and MARK D. HOOVER, ed. (Lovelace Inhalation Toxicology Research Inst., Albuquerque, N. Mex.) 1987 513 p Symposium held in Albuquerque, N. Mex., 12-16 Jan. 1987; co-sponsored by American Inst. of Chemical Engineers, ASTM, GE Co., LANL, Sandia National Labs., AFSTC, and American Nuclear Society (DE88-006164; CONF-870102-SUMM) Avail: NTIS HC A22/MF A01

The proceedings of the 4th Symposium on Space Nuclear Power Systems are presented. Research and progress on the SP-100 Space Power Reactor and Multimegawatt Space Nuclear Power Programs are detailed. The transactions are divided into several headings including: Future space station power options; Space nuclear missions and applications; Reactors and shielding; Nuclear electric and nuclear propulsion; Refractory alloys and high temperature materials; Testing; Reactors and Shielding II; Nuclear electric and nuclear propulsion II; Radioisotope power systems; Instrumentation and control; Energy conversion and storage;

Radiation, thermal and environmental effects; Energy conversion and storage II; Space nuclear fuels; Thermal management; Energy conversion and storage III; Thermal management II; Multimegawatt system concepts; Simulation and modeling; and Nuclear safety

N88-24374# New Mexico Univ., Albuquerque. Dept. of Chemical and Nuclear Engineering.

TRANSACTIONS OF THE FIFTH SYMPOSIUM ON SPACE NUCLEAR POWER SYSTEMS

MOHAMED S. EL-GENK, ed. and MARK D. HOOVER, ed. (Lovelace Inhalation Toxicology Research Inst., Albuquerque, N. Mex.) 1988 611 p Symposium held in Albuquerque, N. Mex., 11-14 Jan. 1988; co-sponsored by American Inst. of Chemical Engineers, American Society of Mechanical Engineers, GE Co., LANL, Sandia National Labs., AFSTC, American Nuclear Society and ASTM

(DE88-006165; CONF-880122-SUMM) Avail: NTIS HC A99/MF A01

The Fifth Symposium on Space Nuclear Power Systems took place in Albuquerque, New Mexico, on January 11 to 14, 1988. It was the fifth in an annual series of symposia sponsored principally by the University of New Mexico and the New Mexico technical community, and included Federal government, industrial, national laboratory, and university participants. The past year had seen continued technical and programmatic successes in the SP-100 Space Power Reactor and Multimegawatt Space Nuclear Power programs. With the Space Shuttle to fly again in 1988, more attention can be devoted to developing the technology needed for future long duration space travel. Safe, reliable space nuclear power systems are essential for the success of these missions. Reports of symposium participants follow.

N88-24572*# Engineering and Economics Research, Inc., Vienna, VA.

RESEARCH AND TECHNOLOGY, 1987, GODDARD SPACE FLIGHT CENTER

GENE GUERNY, ed., KAREN MOE, ed., STEVEN PADDACK, ed., GERALD SOFFEN, ed., WALTER SULLIVAN, ed., and JAN BALLARD, ed. (Science Systems and Applications, Inc., Greenbelt, Md.) 1987 255 p Prepared in cooperation with Science Systems and Applications, Inc., Greenbelt, Md. Sponsored by NASA Original document contains color illustrations (NAS 1.15:101097; NASA-TM-101097) Avail: NTIS HC A12/MF A01 CSCL 05D

Research at Goddard Space Flight Center during 1987 is summarized. Topics addressed include space and earth sciences, technology, flight projects and mission definition studies, and institutional technology. B.G.

N88-24598*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AIRCRAFT AEROELASTICITY AND STRUCTURAL DYNAMICS RESEARCH AT THE NASA LANGLEY RESEARCH CENTER: SOME ILLUSTRATIVE RESULTS

ROBERT V. DOGGETT, JR. and F. W. CAZIER, JR. May 1988 13 p Proposed for presentation at the 16th Congress of the International Council of the Aeronautical Sciences (ICAS), Jerusalem, Israel, 28 Aug. - 2 Sep. 1988 (NASA-TM-100627; NAS 1.15:100627) Avail: NTIS HC A03/MF A01 CSCL 01A

Highlights of nine different research studies are described. Five of these topics relate directly to fixed-wing aircraft and range from flutter studies using relatively simple and inexpensive wind-tunnel models to buffet studies of the vertical tails of an advanced high performance configuration. The other four topics relate directly to rotary-wing aircraft and range from studies of the performance and vibration characteristics of an advanced rotor design to optimization of airframe structures for vibration attenuation. Author

N88-24730# Foreign Applied Sciences Assessment Center, La Jolla, CA.

SOVIET COMBUSTION RESEARCH

06 RESEARCH AND DEVELOPMENT

W. J. MCLEAN, C. A. AMANN, C. T. BOWMAN, P. A. LIBBY, and R. E. PALMER Mar. 1987 299 p
(PB88-182324; FASAC-TAR-3120) Avail: NTIS HC A13/MF A01 CSCL 21B

The report is an assessment of Soviet basic and applied combustion research, prepared by a panel of seven U.S. combustion scientists and engineers who evaluated a large body of published Soviet scientific literature. The panel examined a broad selection of topics in Soviet combustion research, spanning the range from very applied to very fundamental. Soviet research related to combustion of energetic materials (e.g., propellants and explosives) was intentionally omitted from the assessment. Chapter headings include the following: Assessments, Solid fuels combustion; Heat-engine combustion; Practical combustion of gaseous and liquid fuels--Combustion and explosion safety; Theory of laminar and turbulent reacting flows; Combustion chemistry; Advanced combustion diagnostics and instrumentation. GRA

N88-24950# Defense Intelligence Agency, Washington, DC. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 83, MAY - JUNE 1986
Sep. 1987 133 p
(AD-A190969; DIA-DST-2700Z-007-87) Avail: NTIS HC A07/MF A01 CSCL 09C

This is the Soviet Laser Bibliography for May-June 1986, and is No. 83 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications systems; beam propagation; adaptive optics; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. GRA

N88-25327*# Princeton Univ., NJ. Dept. of Chemical Engineering.
NASA RESEARCH PROGRAM: THE ROLES OF FLUID MOTION AND OTHER TRANSPORT PHENOMENA IN THE MORPHOLOGY OF MATERIALS Final Report, Jul. 1983 - Oct. 1987
D. A. SAVILLE May 1988 208 p
(Contract NAG3-447)
(NASA-CR-182801; NAS 1.26:182801) Avail: NTIS HC A10/MF A01 CSCL 20L

The influence of transport phenomena on the morphology of crystalline materials was investigated. Two problems were studied: the effects of convection on the crystallization of pure materials, and the crystallization of proteins from solution.

N88-25428*# National Aeronautics and Space Administration, Washington, DC.
NASA HISTORY DATA BOOK. VOLUME 1: NASA RESOURCES 1958-1968
JANE VANNIMMEN, LEONARD C. BRUNO, and ROBERT L. ROSHOLT 1988 639 p
(Contract NASW-3597)
(NASA-SP-4012-VOL-1; NAS 1.21:4012-VOL-1; LC-74-600126)
Avail: NTIS MF A01; SOD HC \$57.00 in set of 3 as
033-000-01017-6 CSCL 05D

This is Volume 1, NASA Resources 1958-1968, of a three-volume series providing a 20-year compilation of summary statistical and other data descriptive of NASA's programs in aeronautics and manned and unmanned spaceflight. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. Author

N88-25429*# National Aeronautics and Space Administration, Washington, DC.

NASA HISTORICAL DATA BOOK. VOLUME 2: PROGRAMS AND PROJECTS 1958-1968
LINDA NEUMAN EZELL 1988 652 p
(Contract NASW-3597)
(NASA-SP-4012-VOL-2; NAS 1.21:4012-VOL-2; LC-74-600126)
Avail: NTIS MF A01; SOD HC \$57.00 in set of 3 as
033-000-01017-6 CSCL 05D

This is Volume 2, Programs and Projects 1958-1968, of a three-volume series providing a 20-year compilation of summary statistical and other data descriptive of NASA's programs in aeronautics and manned and unmanned spaceflight. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. Author

N88-25430*# National Aeronautics and Space Administration, Washington, DC.

NASA HISTORICAL DATA BOOK. VOLUME 3: PROGRAMS AND PROJECTS 1969-1978
LINDA NEUMAN EZELL 1988 492 p
(Contract NASW-3597)
(NASA-SP-4012-VOL-3; NAS 1.21:4012-VOL-3; LC-74-600126)
Avail: NTIS MF A01; SOD HC \$57.00 in set of 3 as
033-000-01017-6 CSCL 05D

This is Volume 3, Programs and Projects 1969-1978, of a three-volume series providing a 20-year compilation of summary statistical and other data descriptive of NASA's programs in aeronautics and manned and unmanned spaceflight. This series is an important component of NASA published historical reference works, used by NASA personnel, managers, external researchers, and other government agencies. Author

N88-25680*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PROCEEDINGS OF THE MOBILE SATELLITE CONFERENCE
WILLIAM RAFFERTY May 1988 536 p Conference held in Pasadena, Calif., 3-5 May 1988 Sponsored by NASA, Washington
(Contract NAS7-918)
(NASA-CR-182964; NAS 1.26:182964; JPL-PUBL-88-9) Avail:
NTIS HC A23/MF A01 CSCL 17B

A satellite-based mobile communications system provides voice and data communications to mobile users over a vast geographic area. The technical and service characteristics of mobile satellite systems (MSSs) are presented and form an in-depth view of the current MSS status at the system and subsystem levels. Major emphasis is placed on developments, current and future, in the following critical MSS technology areas: vehicle antennas, networking, modulation and coding, speech compression, channel characterization, space segment technology and MSS experiments. Also, the mobile satellite communications needs of government agencies are addressed, as is the MSS potential to fulfill them.

N88-26031# Methodist Hospital, Indianapolis, IN. Research and Development Dept.

THE US SPACE PROGRAMME
SPACEWALK/EXTRAVEHICULAR ACTIVITY EXPERIENCE: PAST, PRESENT AND FUTURE
THOMAS P. MOORE *In* ESA, Proceedings of the Colloquium on Space and Sea p 115-120 Mar. 1988
Avail: NTIS HC A15/MF A01

The history and prospects of extravehicular activity (EVA) in NASA space programs are reviewed. The first EVA in the United States program took place on Gemini 4 in 1965. Lunar exploration was accomplished by 14 two-crewmember EVAs during the Apollo program which began in 1968. The United States' only long duration space flight experience took place in 1973 to 1974 aboard Skylab, with 10 EVAs being performed. Since the beginning of the Space Shuttle program in 1981, there have been 13 two-crewmember EVAs. Space Station is planned for component construction during

EVA's for initial operation during the mid 1990s. Physiological effects on crews, particularly metabolic rate, are mentioned. ESA

N88-26096*# Lockheed Engineering and Management Services Co., Inc., Washington, DC.

USSR SPACE LIFE SCIENCES DIGEST, ISSUE 18

LYDIA RAZRAN HOOKE, ed., P. LYNN DONALDSON, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, D. C.) Washington NASA Jul. 1988 140 p

(Contract NASW-4292)

(NASA-CR-3922(21); NAS 1.26:3922(21)) Avail: NTIS HC A07/MF A01 CSCL 06B

This is the 18th issue of NASA's USSR Life Sciences Digest. It contains abstracts of 50 papers published in Russian language periodicals or presented at conferences and of 8 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. A review of a recent Aviation Medicine Handbook is also included. The abstracts in this issue have been identified as relevant to 37 areas of space biology and medicine. These areas are: adaptation, aviation medicine, biological rhythms, biospherics, body fluids, cardiovascular and respiratory systems, cytology, developmental biology, endocrinology, enzymology, equipment and instrumentation, exobiology, gastrointestinal system, genetics, gravitational biology, group dynamics, habitability and environmental effects, hematology, human performance, immunology, life support systems, man-machine systems, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, perception, personnel selection, psychology, radiobiology, reproductive biology, space biology and medicine, and space industrialization. Author

N88-26268# Sandia National Labs., Albuquerque, NM.

TECHNOLOGY TRANSFER, SANDIA NATIONAL LABORATORIES Annual Report, fiscal year 1987

Apr. 1988 33 p

(Contract DE-AC04-76DP-00789)

(DE88-009790; SAND-87-0749) Avail: NTIS HC A03/MF A01

Sandia National Laboratories, a national security engineering and science laboratory, strives to make its new technology easily accessible to U.S. private industry, local and state governments, universities, and other Federal laboratories. This goal of extending technological advancements beyond our national defense priorities is consistent with the wider concept that our security is strengthened by energy stability, economic competitiveness, environmental preservation, and other areas that maintain our national vitality. In addition, the Technology Transfer Program selectively targets recipients of information and enhances information control aspects of national security. This report reflects examples of technology transfer from the past year and summarizes some of our activities and concerns. DOE

N88-26279*# National Aeronautics and Space Administration, Washington, DC.

PLANETARY GEOLOGY: GOALS, FUTURE DIRECTIONS, AND RECOMMENDATIONS Final Report

Aug. 1988 23 p Workshop held in Tempe, Ariz., Jan. 1987

(NASA-CP-3005; NAS 1.55:3005) Avail: NTIS HC A03/MF A01 CSCL 03B

Planetary exploration has provided a torrent of discoveries and a recognition that planets are not inert objects. This expanded view has led to the notion of comparative planetology, in which the differences and similarities among planetary objects are assessed. Solar system exploration is undergoing a change from an era of reconnaissance to one of intensive exploration and focused study. Analyses of planetary surfaces are playing a key role in this transition, especially as attention is focused on such exploration goals as returned samples from Mars. To assess how the science of planetary geology can best contribute to the goals of solar system exploration, a workshop was held at Arizona State University in January 1987. The participants discussed previous accomplishments of the planetary geology program, assessed the

current studies in planetary geology, and considered the requirements to meet near-term and long-term exploration goals. Author

N88-26397*# Bionetics Corp., Hampton, VA.

SOME OPERATIONAL ASPECTS OF A ROTATING ADVANCED-TECHNOLOGY SPACE STATION FOR THE YEAR 2025 Contractor Report, May - Nov. 1987

M. J. QUEJO, A. J. BUTTERFIELD, W. F. CUDDIHY, C. B. KING, R. W. STONE, J. R. WROBEL, and P. A. GARN Jun. 1988 313 p

(Contract NAS1-18267)

(NASA-CR-181617; NAS 1.26:181617) Avail: NTIS HC A14/MF A01 CSCL 22B

The study of an Advanced Technology Space Station which would utilize the capabilities of subsystems projected for the time frame of the years 2000 to 2025 is discussed. The study includes tradeoffs of nuclear versus solar dynamic power systems that produce power outputs of 2.5 megawatts and analyses of the dynamics of the spacecraft of which portions are rotated for artificial gravity. The design considerations for the support of a manned Mars mission from low Earth orbit are addressed. The studies extend to on-board manufacturing, internal gas composition effects, and locomotion and material transfer under artificial gravity forces. The report concludes with an assessment of technology requirements for the Advanced Technology Space Station. Author

N88-27119*# Sverdrup Technology, Inc., Cleveland, OH.

RESOURCES: NASA FOR ENTREPRENEURS

MARY ANN JANNAZO May 1988 44 p Sponsored by NASA, Washington, D. C. Original contains color illustrations (NASA-CR-182152; NAS 1.26:182152) Avail: NTIS HC A03/MF A01 CSCL 05A

The services of NASA's Technology Utilization Program are detailed and highlights of spinoff products in various stages of completion are described. Areas discussed include: Stirling engines for automotive applications, klystron tubes used to reduce power costs at UHF television stations, sports applications of riblet film (e.g., boat racing), reinforced plastic for high-temperature applications, coating technology appropriate for such applications similar to the renovation of the Statue of Liberty, and medical uses of fuel pump technology (e.g., heart pumps). J.P.B.

N88-27820# California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.

RESEARCH IN APPLIED MATHEMATICS Final Report

G. B. WHITHAM 14 Mar. 1988 5 p

(Contract N00014-85-K-0403)

(AD-A192385; REPT-57) Avail: NTIS HC A02/MF A01 CSCL 20A

Most of the work has been on shock dynamics, a term we use of problems of the focusing of curved shocks, the diffraction of shocks by bodies or density layers, the propagation of shocks down curved tubes and channels, and the stability of converging shocks. Our earlier theoretical work is described in the book *Linear and Nonlinear* by G.B. Whitham, and references given there. This theoretical work on shock dynamics had been found by experiments to be extremely useful in practical situations. However, the analytic results had been limited to fairly simple situations. The numerical scheme originally proposed was again limited and could not hope to handle some of the interesting practical situations. GRA

N88-27881*# National Aeronautics and Space Administration, Langley Research Center, Hampton, VA.

PUBLICATIONS ON ACOUSTICS RESEARCH AT THE LANGLEY RESEARCH CENTER DURING 1980-1986

LINDA W. SUTHERLAND, comp. Jul. 1988 67 p

(NASA-TM-100590; NAS 1.15:100590) Avail: NTIS HC A04/MF A01 CSCL 20A

This report is a compilation of publications from acoustics research at the Langley Research Center. The reports are listed in chronological order and summarize the written output of the

06 RESEARCH AND DEVELOPMENT

Acoustics Division and its predecessor, The Acoustics and Noise Reduction Division, for the period 1980 through 1986. The information assembled has been extracted from the 1980 through 1986 issues for the Technical Memorandum entitled, Scientific and Technical Information Output of the Langley Research Center for the Calendar Year. Author

N88-27929# Massachusetts Inst. of Tech., Lexington. Lincoln Lab.

SOLID STATE RESEARCH Quarterly Technical Report, 1 May - 31 Jul. 1987

ALAN L. MCWHORTER 15 Aug. 1987 94 p
(Contract F49620-85-C-0002)
(AD-A192837; REPT-1987; REPT-3; ESD-TR-87-073) Avail:
NTIS HC A05/MF A01 CSCL 20L

The topics covered are solid state device research, quantum electronics, materials research, microelectronics, and analog device technology. GRA

N88-27977# Oak Ridge National Lab., TN.
TECHNOLOGY TRANSFER FOR DOE'S OFFICE OF TRANSPORTATION SYSTEMS: ASSESSMENT AND STRATEGIES

S. A. SNELL, M. A. BROWN, and A. M. ZEREGA Apr. 1988 105 p
(Contract DE-AC05-84OR-21400)
(DE88-010760; ORNL/CON-244) Avail: NTIS HC A06/MF A01

This report reviews and assesses the technology transfer effort of the DOE's Office of Transportation Systems (OTS) and offers recommendations for future technology transfer activities. The OTS technology transfer strategy calls for maximum industry involvement in both the identification and solution of R and D problems. This strategy is supported not only by utilizing industry as the research contractor, but also through a variety of other technology transfer activities. After reviewing the technical accomplishments of the Office, the report describes some of the barriers that inhibit commercialization of these accomplishments. Primary, secondary, and spin-off audiences for OTS R and D are then characterized. An inventory of recent OTS technology transfer activities follows and is supplemented by nine detailed case studies of technology transfer. These case studies represent five distinct approaches to technology transfer and a wide array of mechanisms including: contracting to industry, licensing, demonstration projects, user facilities, and financial incentives. The report ends with a list of recommended future technology transfer activities. DOE

N88-28138# Oak Ridge National Lab., TN.
THE HIGH TEMPERATURE MATERIALS LABORATORY: A NEW RESEARCH AND USER FACILITY AT THE OAK RIDGE NATIONAL LABORATORY

Feb. 1988 40 p
(Contract DE-AC05-84OR-21400)
(DE88-010792; ORNL/M-363/R1) Avail: NTIS HC A03

The High Temperature Materials Laboratory (HTML) is a new \$19 million facility that serves as the focal point for high-temperature ceramics research at the Oak Ridge National Laboratory (ORNL). It is also a major user facility, providing members of the industrial and university research communities access to the extensive array of special research equipment needed to characterize the microstructure and microchemistry of materials and to investigate the effect of these parameters on the physical and mechanical properties of the materials. User research equipment is divided among four User Centers: Materials Analysis, High Temperature X-ray Diffraction, Physical Properties, and Mechanical Properties. This brochure provides brief descriptions of each of the major pieces of research equipment in the User Centers. Hands-on operation of this equipment by qualified users is encouraged. A User Center staff is available with special responsibility of maintaining the User Center equipment and for interacting with users. Both proprietary and nonproprietary research may be performed by users in the HTML, with no charge for nonproprietary research. Proprietary research, however, is done on a full cost recovery basis. DOE

N88-28171*# National Aeronautics and Space Administration, Washington, DC.

MICROGRAVITY SCIENCE AND APPLICATIONS BIBLIOGRAPHY, 1987 REVISION

Sep. 1988 55 p
(NASA-TM-4067; NAS 1.15:4067) Avail: NTIS HC A04/MF A01 CSCL 12A

This edition of the Microgravity Science and Applications (MSA) Bibliography is a compilation of Government reports, contractor reports, conference proceedings, and journal articles dealing with flight experiments utilizing a low gravity environment to elucidate and control various processes or with ground based activities that provide supporting research. It encompasses literature published but not cited in the 1984 Revision and literature which has been published in the past year. Subdivisions of the bibliography include six major categories: Electronic Materials; Metals, Alloys, and Composites; Fluid Dynamics and Transport; Biotechnology; Glass and Ceramics; and Combustion. Also included are publications from the European, Soviet, and Japanese MSA programs. In addition, there is a list of patents and appendices providing a compilation of an anonymously authored collection of reports and a cross reference index. Author

N88-28511# European Space Agency, Paris (France).
THE WORLD'S WATER RESOURCES: A MAJOR NEGLECT. A STUDY IN REMOTE SENSING IN HYDROLOGY AND WATER MANAGEMENT

R. W. HERSCHY, E. C. BARRETT, J. N. ROOZEKRANS, and J. HUNT, ed. Mar. 1988 41 p Original contains color illustrations
(ESA-BR-40; ISSN-0250-1589; ETN-88-92778) Avail: NTIS HC A03/MF A01

Satellite remote sensing for water management is discussed. The anticipated advantages of satellite remote sensing for hydrology are not likely to accrue unless specific consideration continues to be given to its peculiar demands both for satellite and/or sensor systems, and for its own supporting programs of research, information sharing, education, and training. The chief and most distinctive needs for hydrological sensors are for dual polarized, scanning multichannel microwave radiometers (primarily for rainfall, ice and snow, and soil moisture evaluation and monitoring) and steerable synthetic aperture radars (primarily for more local snow, surface, and sub-surface water evaluation, and mapping). Hydrological user requirements are especially demanding because many hydrological parameters vary rapidly through both space and time, thus calling for data with the highest possible spatial and temporal resolutions. The operational usage of satellite data in hydrology and water management calls mainly for near-real time access to data, the integration of remotely sensed and collateral data sets, and a disseminated network of relatively low-cost, user-friendly, interactive data processing systems. ESA

N88-28832*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

BIBLIOGRAPHY OF LEWIS RESEARCH CENTER TECHNICAL PUBLICATIONS ANNOUNCED IN 1987

Jun. 1988 362 p
(NASA-TM-100910; E-4162; NAS 1.15:100910) Avail: NTIS HC A16/MF A01 CSCL 05B

This compilation of abstracts describes and indexes the technical reporting that resulted from the scientific and engineering work performed and managed by the Lewis Research Center in 1987. All the publications were announced in the 1987 issues of STAR (Scientific and Technical Aerospace Reports) and/or IAA (International Aerospace Abstracts). Included are research reports, journal articles, conference presentations, patents and patent applications, and theses. Author

N88-29832*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL.

NASA MARSHALL SPACE FLIGHT CENTER SOLAR OBSERVATORY Report, Jan. - Mar. 1988

07 ECONOMICS, COSTS AND MARKETS

JAMES E. SMITH Aug. 1988 82 p
(NASA-TM-100339; NAS 1.15:100339) Avail: NTIS HC A05/MF
A01 CSCL 14B

A description is provided of the NASA Marshall Space Flight Center's Solar Vector Magnetograph Facility and a summary is given of its observations and data reduction during Jan. to Mar. 1988. The systems that make up the facility are a magnetograph telescope, an H-alpha telescope, a Questar telescope, and a computer center. The data are represented by longitudinal contours with azimuth plots. Author

N88-29859*# National Aeronautics and Space Administration, Washington, DC.

THE NASA ELECTRIC PROPULSION PROGRAM

JAMES R. STONE, DAVID C. BYERS, and DAVID Q. KING (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 1988 20 p Presented at the 20th International Electric Propulsion Conference, Garmisch-Partenkirchen, Fed. Republic of Germany, 3-6 Oct. 1988; sponsored by DGLR, AIAA and JSASS (NASA-TM-101324; E-4330; NAS 1.15:101324; IEPC-88-002) Avail: NTIS HC A03/MF A01 CSCL 21H

The NASA OAST Propulsion, Power, and Energy Division supports an electric propulsion program aimed at providing benefits to a broad class of missions. Concepts which have the potential to enable or significantly benefit space exploration and exploitation are identified and advanced toward application in the near and far term. This paper summarizes recent program progress in mission/system analysis; in electrothermal, electrostatic, and electromagnetic propulsion technologies; and in propulsion/spacecraft integration. Author

N88-30447# European Space Agency, Paris (France).
WITH AN EYE TO THE FUTURE: ESA GENERAL STUDIES PROGRAM 1988

NORMAN LONDDON, ed. and BRIGITTE KALDEICH, ed. Apr. 1988 38 p Original contains color illustrations (ESA-SP-1100; ISSN-0250-1589; ETN-88-93047) Avail: NTIS HC A03/MF A01

The ESA programs concerning end-to-end telematics architecture; long-term evolution of telecommunications services and systems; long-term evolution of Earth observation; microgravity utilization; autonomous orbital capability architecture; in-orbit assembly, servicing, and tending; long-term evolution of space transportation systems; and European ground infrastructure are presented. ESA

N88-30554*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE DEEP SPACE NETWORK: AN INSTRUMENT FOR RADIO ASTRONOMY RESEARCH

N. A. RENZETTI, G. S. LEVY, T. B. H. KUIPER, P. R. WALKEN, and R. C. CHANDLEE 1 Sep. 1988 63 p Sponsored by NASA, Washington, D.C. (NASA-CR-183219; JPL-PUBL-82-68-REV-1; NAS 1.26:183219) Avail: NTIS HC A04/MF A01 CSCL 03A

The NASA Deep Space Network operates and maintains the Earth-based two-way communications link for unmanned spacecraft exploring the solar system. It is NASA's policy to also make the Network's facilities available for radioastronomy observations. The Network's microwave communication systems and facilities are being continually upgraded. This revised document, first published in 1982, describes the Network's current radioastronomy capabilities and future capabilities that will be made available by the ongoing Network upgrade. The Bibliography, which includes published papers and articles resulting from radioastronomy observations conducted with Network facilities, has been updated to include papers to May 1987. Author

N88-30581*# National Aeronautics and Space Administration, Washington, DC.

SCIENCE AT NASA FIELD CENTERS: FINDINGS AND RECOMMENDATIONS ON THE SCOPE, STRENGTH AND INTERACTIONS OF SCIENCE AND SCIENCE-RELATED TECHNOLOGY PROGRAMS

May 1988 92 p
(Contract NAGW-1090)
(NASA-TM-101188; NAS 1.15:101188) Avail: NTIS HC A05/MF
A01 CSCL 05A

Great achievements by NASA and other space agencies have shown us what opportunities lie in the opening of the space frontier. A broad and vigorous science program in NASA is vital to full U.S. exploitation of these new opportunities. Today, science in NASA Centers is characterized by its breadth, relevance, and excellence. The NASA in-house science program and its links to university programs constitute a vitally important national resource. Maintaining excellence as a foundation for the future is a fundamental responsibility of NASA, one that requires constant attention and effort. This report by the NASA Center Science Assessment Team documents the current state of science within NASA and recommends actions to maintain a healthy program. NASA scientists have always played key roles in planning, guiding, and conducting national programs in space science. The review of Center science programs is intended to ensure that both NASA and the nation can depend on their continuing contribution in these roles. Author

N88-30583*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

RESEARCH AND TECHNOLOGY OF THE LYNDON B. JOHNSON SPACE CENTER Annual Report, 1987

Feb. 1988 98 p
(NASA-TM-100463; S-575; NAS 1.15:100463) Avail: NTIS HC
A05/MF A01 CSCL 05D

Johnson Space Center accomplishments in new and advanced concepts during 1987 are highlighted. Included are research projects funded by the Office of Aeronautics and Space Technology, Solar System Exploration and Life Sciences research funded by the Office of Space Sciences and Applications, and advanced Programs tasks funded by the Office of Space Flight. Summary sections describing the role of the Johnson Space Center in each program are followed by descriptions of significant projects. Descriptions are suitable for external consumption, free of technical jargon, and illustrated to increase ease of comprehension. Author

07

ECONOMICS, COSTS AND MARKETS

Includes Costs and Cost Analysis, Cost Control and Cost Effectiveness, Productivity and Efficiency, Economics and Trade, Financial Management and Finance, Investments, Value and Risk (Monetary), Budgets and Budgeting, Marketing and Market Research, Consumerism, Purchasing, Sales, Commercialization, Competition, Accounting.

A88-10850

HAS MANNED SPACE FLIGHT A FUTURE?

M. H. HARRISON Spaceflight (ISSN 0038-6340), vol. 29, Sept. 1987, p. 325-328.

The need for manned space flights in the future is argued. The functions humans can perform in space, such as respond to emergencies, improve equipment, and monitor in real time, and the benefits human presence in space will provide are described. Current and proposed uses for space, such as telecommunications, remote sensing, military, and materials processing, are discussed.

I.F.

07 ECONOMICS, COSTS AND MARKETS

A88-13451#

BUSINESS ISSUES OF MATERIALS PROCESSING IN SPACE

JOHN J. EGAN (Coopers and Lybrand, Washington, DC) IAF, The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 175-180.

The complementary roles of government and business in developing commercial materials processing in space (MPS) are discussed. The potentially long duration, high cost, and risk of the development phase of a typical MPS venture are emphasized, and the political implications are indicated. A number of ways in which the U.S. government could act to encourage commercial MPS programs (a NASA policy goal) are considered, including elimination of tax and import/export barriers, construction and maintenance of a space infrastructure (the Space Station) with some support from user fees, opportunity for proof-of-concept experiments on MPS technologies, and clear and fair regulation of space-laboratory management questions. T.K.

A88-14363

LOW-COST COMMERCIAL LAUNCH VEHICLE - LIBERTY

GARY C. HUDSON (Pacific American Launch Systems, Inc., Redwood City, CA) SAE, Aerospace Vehicle Conference, Washington, DC, June 8-10, 1987. 12 p. refs (SAE PAPER 871334)

The design features of a low cost booster capable of inserting Space Shuttle-sized loads into low earth orbit are presented, and the commercial prospects for such a launch vehicle are assessed. Such ELVs are expected to be capable of furnishing highly reliable launch services on the basis of technology established as far back as the 1960s, foregoing all attempts to incorporate AI and robotics. Attention is given to the conclusions of studies into the commercial viability of ELVs that have been conducted by both NASA and independent researchers. Detailed specifications for the Liberty II launch vehicle are tabulated. O.C.

A88-14368

USSR EXPORT POSSIBILITIES IN THE FIELD OF SPACE HARDWARE

VLADIMIR PODSADNIK (Glavkosmos, USSR) SAE, Aerospace Vehicle Conference, Washington, DC, June 8-10, 1987. 7 p. (SAE PAPER 871342)

After presenting the pertinent performance capabilities of the Soviet Proton space launch vehicle, attention is given to such additional Soviet spacecraft systems possessing commercial value to Western business and government concerns as the Meteor earth resources satellite, the Mir orbiting space station, and various satellite launching and communication satellite leasing services. Also discussed are the parameters to be observed by foreign space experiment designers who wish to make use of the laboratory facilities aboard both unmanned Cosmos satellites and the Salyut manned space station for materials science-related researches. O.C.

A88-16218#

THE GEOSTAR APPROACH TO SPACE BUSINESS

MARTIN A. ROTHBLATT (Geostar Corp., Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 3 p. (IAF PAPER 87-627)

The Geostar applications, technology implementation, and business statistics are briefly reviewed. The Geostar satellite communications applications include automatic vehicle monitoring, railway control and signalling, aeronautical/maritime communications, navigation, surveillance, personal communications, law enforcement, and environmental monitoring. Geostar technology implementation is summarized for the space, user, and control segments. V.L.

A88-16221#

SPACEHAB'S COMMERCIALIZATION OF MICROGRAVITY RESEARCH ACTIVITIES

THOMAS C. TAYLOR (SPACEHAB, Inc., Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 10 p. refs (IAF PAPER 87-629)

Spacehab, a module in the Space Shuttle offering a man-tended research capability, is discussed. The commercial market in space and Spacehab's possible role in speeding up its slow development are addressed. The lower costs of Spacehab in comparison with other alternatives are pointed out. The reduction of risks involved in the development of the Space Station is considered, and a proposed development scenario involving Spacehab is described. The basic design of Spacehab is briefly presented. C.D.

A88-16223#

STATION PRICING - NOT JUST A QUESTION OF 'HOW MUCH DOES IT COST?'

JOHN J. EGAN (The Egan Group, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 6 p. (IAF PAPER 87-631)

Aspects of Space Station pricing policy are discussed. The purpose of pricing is reviewed, and the use of pricing to influence customer behavior is discussed. Pricing methodology is addressed, and the issue of who pays is examined. C.D.

A88-16250#

BENEFIT FROM SPACE TECHNOLOGY - A VIEW FROM A DEVELOPING COUNTRY

Y. S. RAJAN and JACOB NINAN (Indian Space Research Organization, Bangalore, India) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 37 p. refs (IAF PAPER 87-679)

The benefits of space technology for developing countries, including the potential to spur economic and social development, are discussed. Space technological applications for communications, meteorology, and remote sensing are considered. It is noted that a national approach of education and experience is necessary to make space technology a part of the cultural system. Indian technological programs such as the satellite instructional television experiment are discussed, and the impact of space technology on Indian industry is considered. Parameters for determining the best possible uses of space technology for the cases of specific developing countries are outlined. R.R.

A88-17923

COST ESTIMATOR'S REFERENCE MANUAL

RODNEY D. STEWART (Mobile Data Services, Huntsville, AL) and RICHARD M. WYSKIDA (Alabama, University, Huntsville, AL) New York, Wiley-Interscience, 1987, 643 p. refs

This manual offers proven techniques for cost estimating in a format that makes it useful to both novices and experts for a variety of purposes. It describes how to develop a credible and accurate cost estimate, where to get supporting information and data, what tools and techniques are available, and whom to contact about becoming certified, obtaining publications and information, and gaining education and training in the profession. In-depth discussions of estimating techniques are presented, including cost allocation, discounted cash flow analysis, learning curves, parametric estimating, risk analysis, and the use of microcomputers in cost estimating. Estimating in specialized situations, such as high-technology projects, construction, and government procurements and software development, is addressed. The emergence of cost estimating as an established profession and the use of artificial intelligence in cost estimating are examined. C.D.

A88-21329

SPACEPLANES - KEY TO THE FUTURE

E. HOEGENAUER Spaceflight (ISSN 0038-6340), vol. 29, Dec. 1987, p. 409-412.

The requirements for third generation space-transportation systems are discussed. It is noted that the cost-damping effect hoped for in the Hermes program will be outweighed by factors such as expensive new technology. It is recommended that specific payload costs for space transportation should amount to at most 20 percent of the costs for the same mission with Ariane and Hermes, and that development costs be kept to a minimum. Other guidelines include comparable safety and reliability to that of airlines and the use of manned flight only when necessary. R.R.

A88-21532**GOING MOBILE**

ERIC BRUS *Microwaves & RF* (ISSN 0745-2993), vol. 26, Dec. 1987, p. 41-45, 47.

By 1990, all metropolitan areas in the U.S. and rural areas close to major cities or towns are expected to have cellular telephone service; 22 Canadian cities also feature cellular service. To supply mobile telecommunication services to sparsely-populated rural areas, a mobile satellite service (MSS) is now being developed. In this paper the projected possibilities of the MSS system are discussed, including a possibility that a piggyback-MSS payload be added to the GSTAR-4 satellite which is scheduled for a launch in 1988 or 1989; one in which some of the hardware from aborted direct-broadcast satellites would be used; and the possibility of building a new MSS satellite with large servicing capacity. Canada is planning to launch its own mobile satellite, MSAT, in the early 1990s. The MSS is expected to be 'generic', serving not only people on land but maritime and aeronautical users as well. It will also offer major benefits to truck and automobile drivers, making it possible for them to conduct business or to call for assistance from locations beyond the range of cellular systems. I.S.

A88-21571**COMMERCIAL UTILISATION IN U.K. EARTH OBSERVATION**

F. W. JACKSON (Marconi Space Systems, Ltd., Portsmouth, England) (Columbus II; Proceedings of the Second Workshop, Hanover, Federal Republic of Germany, June 9-11, 1986) *Space Technology - Industrial and Commercial Applications* (ISSN 0277-4488), vol. 7, no. 1-2, 1987, p. 161-164.

Technological and management aspects of the commercial utilization of satellite remote sensing data are discussed, with a focus on the implications for the ESA Columbus program, summarizing results obtained by the Value Added Industry Panel of the UK Columbus Utilization Study Program. Topics addressed include applications and market identification and development, sensors and payloads, and data handling. The types of government and nongovernment customers interested in geological, hydrological, coastal, marine, atmospheric, polar, land-use, agricultural, and forestry data are identified; the need for more generalized methods of data analysis is indicated; and the importance of data security and reliable service is stressed. A number of pilot projects to enhance the usability of remote-sensing data and inform potential users are recommended. T.K.

A88-21652**LAUNCHING A COMMERCIAL SPACE INDUSTRY**

VERNON L. GROSE (Omega Systems Group, Arlington, VA) IN: *Space Station automation II; Proceedings of the Meeting*, Cambridge, MA, Oct. 28-30, 1986. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1987, p. 190-200.

Issues involved in the commercialization of space are discussed. The most important constraints on such commercialization are identified. The importance of expendable launch vehicles and the effects of SDI are among the topics addressed. C.D.

A88-23866**PLANNING OF RISK IN DEFENCE DEVELOPMENT PROJECTS**

D. K. HOPKINS (Hunting Engineering, Ltd., Bedford, England) IN: *Development time scales: Their estimation and control; Proceedings of the Symposium*, London, England, Feb. 12, 1987. London, Royal Aeronautical Society, 1987, p. 76-104.

An examination is undertaken of the consequences of the current trend towards transferring the financial risks involved in

the development of defense-related systems from the governmental customer to the contractor. The present forms of competitive fixed-price or incentive tender make it probable that the lowest bidder will not have covered all possible risks in the absence of an agreed-upon understanding and discipline for the assessment of such risks. Funding authorities must understand the approach to risk used by industry, as well as the meaning of propositions based on that approach. O.C.

A88-23925#**THE CIVIL SPACE PROGRAM: AN INVESTMENT IN AMERICA - REPORT OF AN AIAA WORKSHOP**

Washington, DC, American Institute of Aeronautics and Astronautics, 1987, 64 p. refs

In the interest of formulating a strategic view of U.S. civil space systems' development, the AIAA convened a workshop to review current and prospective commitments of NASA and other competent agencies. Such goals as the creation of space-based global information systems and the aggressive development of space-processed industrial products require the intensive funding of space infrastructure resources. These resources will encompass space stations and platforms, lunar/planetary bases, and larger space transportation systems employing more advanced technology than the current Space Shuttle. O.C.

A88-24452**CHINESE LAUNCH VEHICLES AIM FOR THE COMMERCIAL MARKET**

PHILLIP S. CLARK (Commercial Space Technologies, Ltd., London, England) *Space Markets* (ISSN 0258-4212), Winter 1987, p. 178-187.

While the Chinese space program appears, in light of information being made available to the West, to be on the verge of substantial expansion, its direction is presently judged to be substantially governed by the international response to China's offers of commercial satellite-launch services. This criterion will be especially relevant to the development of the next-generation of the CZ-2/4L and CZ-3A/4L launch vehicles, each of which employs four strap-on liquid rocket booster units for payload performance enhancement. Attention is presently given to Chinese satellite launch history thus far, and prospective development schedules and performance targets. O.C.

A88-27582#**TRANSPORTATION SYSTEM CHOICES - ROI IMPLICATIONS**

CAROLE GAELICK and JOEL S. GREENBERG (Princeton Synergetics, Inc., NJ) IN: *AIAA International Communication Satellite Systems Conference*, 12th, Arlington, VA, Mar. 13-17, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 477-484. (AIAA PAPER 88-0840)

The selection of a space transportation system for a particular mission is a complex process that requires the consideration of many factors including availability, cost, payload delivery capability, payload placement accuracy, reliability of launch operations, failure/recovery modes, and cost and availability of insurance. The importance of considering the multiple attributes of alternative transportation systems in transportation selection is demonstrated in terms of financial impacts (profit, cash flow, return on investment, and risk) on a typical communications satellite business venture. The DOMSAT III stochastic communications satellite financial planning model used in the analyses is described, as are other applications of the model. Author

A88-27584*# Ford Aerospace and Communications Corp., Palo Alto, CA.

THE ECONOMICS OF SATELLITE RETRIEVAL

KENT M. PRICE (Ford Aerospace and Communications Corp., Space Systems Div., Palo Alto, CA) and JOEL S. GREENBERG (Princeton Synergetics, Inc., NJ) IN: *AIAA International Communication Satellite Systems Conference*, 12th, Arlington, VA, Mar. 13-17, 1988, Technical Papers. Washington, DC, American

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Institute of Aeronautics and Astronautics, 1988, p. 496-510.
(Contract NAS3-24253)
(AIAA PAPER 88-0843)

The economics of space operations with and without the Space Station have been studied in terms of the financial performance of a typical communications-satellite business venture. A stochastic Monte-Carlo communications-satellite business model is employed which includes factors such as satellite configuration, random and wearout failures, reliability of launch and space operations, stand-down time resulting from failures, and insurance by operation. Financial performance impacts have been evaluated in terms of the magnitude of investment, net present value, and return on investment. R.R.

A88-27954

U.S. SPACE PLATFORM FIRMS AIM FOR 1991 SERVICE START

HERESA M. FOLEY Aviation Week and Space Technology (ISSN 0005-2175), vol. 128, Feb. 29, 1988, p. 36-38,41.

Two private firms must close deals in the first half of 1988 with their respective investors, and begin constructing hardware shortly thereafter, if space operations of their pressurized space modules are to begin on schedule in the early 1990s. One of the two firms will construct an Industrial Space Facility, at an estimated cost of \$700 million; the other will produce 'Spacehab', a pressurized module small enough to fly in the Space Shuttle Cargo Bay. The projected cost of building and testing the first two Spacehab modules and associated ground facilities is \$65-70 million. O.C.

A88-28537

COMPETING FOR A FUTURE IN SPACE - NASA AND THE DEPARTMENT OF DEFENSE

ERASMUS H. KLOMAN Space Policy (ISSN 0265-9646), vol. 4, Feb. 1988, p. 7-11.

The distribution of financial support between the U.S. civilian and military space programs is discussed. The competition in such areas as launch systems, communication satellites, and remote sensing is examined, and consideration is given to the production of new pharmaceutical materials and new chemical or mineral compounds that cannot be made in the earth's gravity-bound environment. The U.S. military space program, including intelligence gathering, arms control monitoring, war planning, crisis management, and early warning of attack, is described. A.S.

A88-28541

ASIA IN SPACE - THE AWAKENING OF CHINA AND JAPAN

ALAIN DUPAS (Paris, Universite; CNES, Paris, France) Space Policy (ISSN 0265-9646), vol. 4, Feb. 1988, p. 31-40.

Progress made by China and Japan in space is reviewed with particular attention given to the ways in which the increasingly important role of these countries can be seen as a threat to the U.S. and Europe. It is noted that China is already a competitor on the satellite launch market, and will soon be able to market satellites which are simpler and cheaper than those offered by Western industry. Moreover, Japan is moving toward autonomy in all fields of space technology. It is anticipated that both of these countries will have a strong presence in space by the year 2000. K.K.

A88-33602

AN ECONOMIC MODEL FOR VENDOR SELECTION

KWEI TANG (Louisiana State University, Baton Rouge) Journal of Quality Technology (ISSN 0022-4065), vol. 20, April 1988, p. 81-89. refs

An economic model for vendor selection is presented. There are two decision factors to be considered in the model: price and material quality. In developing the model, material quality is expressed in terms of monetary units, then combined with price to establish a cost-effective decision criterion for vendor selection. In addition, the interaction between material quality and the vendee's quality control function is discussed. It is shown that this interaction may affect vendor selection. Author

A88-33743

SPACE FOR RENT

DAVID MACLENNAN (New Zealand Spaceflight Association) Spaceflight (ISSN 0038-6340), vol. 30, April 1988, p. 138-140.

Two private-sector space projects that could provide important research and commercial manufacturing facilities in space in the early 1990s are discussed. The Spacehab module will be mounted in the Space Shuttle cargo bay to provide more experimental space, while the Industrial Space Facility will have two modules, one used for housing basic utilities needed for production and the other used to transport raw materials and to resupply equipment and finished products. The building and deployment schedules for these two projects are reviewed and their applications are discussed. C.D.

A88-33781#

MANAGING TEST PROGRAM RISKS

ALFRED M. FEILER and ROBERT GEMINGER IN: Aerospace Testing Seminar, 10th, Los Angeles, CA, Mar. 10-12, 1987, Proceedings. Mount Prospect, IL, Institute of Environmental Sciences, 1987, p. 35-47. refs

This paper describes the program risk management methodology that is currently in use on DoD system development programs. The risk analysis methodology employs probabilistic critical path networking, to account for and correlate the project risk factors. When applied to system test planning, testing, and evaluation, the risk analysis encompasses all test and test support activities. Input data includes variable activity durations, resource (labor, facilities, equipment) requirements, and cost factors. Typically, the risk analysis results are used to establish realistic schedules compatible with acceptable levels of technical, cost and schedule risks. Author

A88-35084

CONCEPT FOR PRIVATE FINANCING AND OPERATION OF THE SPACE STATION

PETER M. STARK (Stark and Strobel Associates, Reston, VA) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 507-511.

(AAS PAPER 86-453)

The paper considers a possible future in which the Space Station is operated by an international partnership of private sector firms. It considers the desirability of this scenario by examining its effects on the various players. It then suggests a series of steps by which such an arrangement might be brought about, including the agreements which would be necessary between the involved governments and the private sector, and the activities each would have to undertake to carry out its part of the bargain. Finally, it addresses whether NASA's baseline Space Station Operations Management Concept offers an indication that the Agency might be more willing to consider a private alternative than might otherwise be thought. Author

A88-35155

SPOT 1 - INTERNATIONAL COMMERCIALIZATION OF REMOTE SENSING

PIERRE BESCOND (Spotimage, Reston, VA) IN: Aerospace century XXI: Space sciences, applications, and commercial developments; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 1631-1636.

(AAS PAPER 86-299)

The role of the Spot satellite in the French and in the international remote sensing effort is considered. The Spot satellite system and its ground segment are described, showing the functioning of the satellite as a remote sensor and the role of the ground segment in market distribution. Further innovations being made on Spot are addressed, and Spot's impact on the remote sensing industry is assessed. C.D.

A88-35895

INDUSTRIAL POTENTIAL OF MICROGRAVITY

H. U. WALTER (ESA, Paris, France), C. BELOUET (Compagnie Generale d'Electricite, Centre de Recherches, Marcoussis, France), and Y. MALMEJAC (CEA, Centre d'Etudes Nucleaires de Grenoble, France) IN: Fluid sciences and materials science in space: A European perspective. Berlin and New York, Springer-Verlag, 1987, p. 681-730. refs

The current status of microgravity research activities and materials processing in space (MPS) is reviewed with reference to work carried out in the U.S., USSR, Japan, and Europe. In particular, attention is given to economic considerations for MPS, production of glasses, crystal growth from the melt, crystal growth from the vapor phase, crystallization of inorganic materials from solutions, protein crystallization, and microgravity-adapted processes. Finally, recommendations for a European policy in the field of MPS are made. V.L.

A88-41281

THE ROLE OF COMMERCIAL SPACE LAUNCH SYSTEMS

COURTNEY A. STADD (DOT, Office of Commercial Space Transportation, Washington, DC) IN: Visions of tomorrow: A focus on national space transportation issues; Proceedings of the Twenty-fifth Goddard Memorial Symposium, Greenbelt, MD, Mar. 18-20, 1987. San Diego, CA, Univelt, Inc., 1987, p. 111-116. (AAS PAPER 87-116)

In the years that have passed since the 1984 passage of the Commercial Space Launch Act, when the U.S. Congress gave the Department of Transportation legislative authority to develop a regulatory program encouraging private-sector investment in commercial launch vehicles, successful development has been seen for a commercial spinoff of the DOD's Medium Launch Vehicle, in the guise of the Delta II launcher. The DOD is noted to have made the commercial adaptability of this ELV one of the primary criteria for selection of a contract winner. O.C.

A88-42901#

SPACE TRANSPORTATION - THE COMMERCIAL USER'S PERSPECTIVE

A. SIMANIS and ROBIN GUBBY (Telesat Canada, Ottawa) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 8 p. refs (AIAA PAPER 88-3492)

The methodology used by the Canadian firm Telesat for realizing a cost-effective launch is discussed. The determination of acquisition cost through analysis of satellite, launch, risk management, financing and management costs is examined. Factors affecting launch vehicle selection include reliability, payload compatibility, performance, contractual terms, program management and price. The goals in acquiring launch services in the ELV market are studied, focusing on the forthcoming Anik E satellite launches. Future launch needs are also examined. R.B.

A88-43963#

THE FUTURE OF COMMERCIAL SPACE MANUFACTURING - RESULTS OF A DELPHI SURVEY

TODD B. HAWLEY IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 137-139.

Prospective commercialization lifetimes have been projected for 12 proposed space commercialization products and processes, using the 'Delphi' method for obtaining a convergence of opinion on a given line of speculation from a body of experts in the fields pertinent to such projections. Fifty experts participated in a two-round Delphi survey concerning the commercially feasible autonomous spaceborne manufacturing of pharmaceuticals (1993), weapons systems (1996), semiconductors (1997), optics (2000), metallurgy (2002), tourism (2002), large-scale space structures (2005), lunar mining (2007), genetic engineering (2008), solar power satellites (2008), asteroid mining (2014), and self-replicating machines (2014). O.C.

A88-43965#

LADY BASE ONE CORPORATION AND THE MARKET FOR SPACE DEVELOPMENT

W. F. MITCHELL, JR. (Lady Base One Corp., Friendswood, TX) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 153-157. refs

A proprietary commercialization scheme is presented for the development of market opportunities for lunar manufacturing and mining products, identifying the technology development requirements for which the launch vehicle, satellite industry, space research management, defense, and scientific communities will be responsible. The lunar base's construction should proceed concurrently with that of the NASA Space Station project; the base should be operational and profitable by 1994. While it costs \$3000 to deliver LOX from the earth to orbit, it may cost as little as \$136 to deliver it to earth orbit from the moon. O.C.

A88-44003*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

SPACE COMMERCIALIZATION AND POWER SYSTEM TECHNOLOGY

H. BRANDHORST, JR. and K. A. FAYMON (NASA, Lewis Research Center, Cleveland, OH) IN: Advanced topics in manufacturing technology: Product design, bioengineering; Proceedings of the Symposium, ASME Winter Annual Meeting, Boston, MA, Dec. 13-18, 1987. New York, American Society of Mechanical Engineers, 1987, p. 61-72.

The development and application of power and energy technologies important to the commercialization of space is discussed, stressing the significance of these technologies to space transportation systems, on-orbit services and on-orbit commercial production and processing ventures. Energy conversion systems examined include solar photovoltaic systems, solar thermal dynamic power systems, and nuclear power systems. Energy storage systems include electrochemical systems, inertial storage systems, and magnetic energy storage systems. In addition, power management and distribution systems used in space commercialization and NASA programs for the commercial development of space are discussed. R.B.

A88-44065

SOCIETY IN ORBIT

W. PAUL BLASE (DCS Corp., Alexandria, VA) and JOHN CAMP (USAF, Wright-Patterson AFB, OH) Space World (ISSN 0038-6332), vol. Y-7-295, July 1988, p. 16-19.

It is argued that, if colonization of space is to be a smooth transition, the political, social, and economic aspects of individual societies and interactions between societies must be addressed well in advance. One important aspect of understanding and planning any space community will be its infrastructure: the physical shell and life support systems that facilitate life in a vacuum. Cost, structural inflexibility, and the extreme danger inherent in space life will influence the social structure and the government of the people that inhabit the structure. It is suggested that the best method of funding a space community is the corporate method, in which the colonists form their own corporation. K.K.

A88-44718#

21ST CENTURY HIGH SPEED TRANSPORT PROPULSION

MARTIN G. SMITH, JR. (Pratt and Whitney, East Hartford, CT) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 24th, Boston, MA, July 11-13, 1988. 9 p. refs (AIAA PAPER 88-2987)

The NASA-sponsored High Speed Commercial Transport (HSCT) program's marketing studies have given attention to 300-passenger 6000-n. mi. range supersonic transports operating in the Mach 2-5 range. A key factor in the feasibility of such aircraft is the propulsion system chosen, which in addition to being fuel efficient must be reliable and environmentally acceptable. These studies have recently progressed to the point where the

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speed regime for the HSCT has been narrowed to Mach 2-plus to Mach 3-plus, using a kerosene-type fuel. A subsequent, more advanced vehicle may use liquid natural gas to cruise at speeds of up to Mach 5. O.C.

A88-44805#

FUNDING - A UNIFIED APPROACH

TOM WARWICK (United Technologies Corp., Pratt and Whitney, West Palm Beach, FL) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 24th, Boston, MA, July 11-13, 1988. 7 p. refs
(AIAA PAPER 88-3247)

Relationships are presented to balance, allocate and reduce cost. These relationships are applied separately or together to assess life cycle cost (LCC) and its cost elements such as research and development (R & D), acquisition, and operating and support (O & S). The relationships are described using a unified approach to better determine preferred funding and total cost alternatives.

Author

A88-45603

SPACE RESOURCES - BREAKING THE BONDS OF EARTH

JOHN S. LEWIS (Arizona, University, Tucson) and RUTH A. LEWIS New York, Columbia University Press, 1987, 428 p.

It is shown how space resources can be used to make a prospective space program affordable. Ways of reducing costs through the use of new technologies based on space resources are suggested. It is maintained that space activities can provide a net economic as well as scientific and technological gain for earth. The space races before and after 1968 are discussed together with lunar resource exploitation, the emergence of near-earth asteroids, current plans and goals for space development, and a proposal for a renewed space program. K.K.

A88-48000#

TITAN III - COMMERCIAL ACCESS TO SPACE

STEPHEN J. GIZINSKI, III and DOUGLAS B. HERRINGTON (Martin Marietta Commercial Titan, Inc., Denver, CO) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 9 p.

(AIAA PAPER 88-3476)

The commercial Titan III launch vehicle is discussed, reviewing the history of the Titan program, the technical aspects of the launcher, and the market outlook. The solid rocket motors of the boost vehicle, core, attitude control system, and payload carrier are described. The vehicle can carry one or two payloads taking up a space of up to 3.65 m in diameter and 10.7 m in length. The avionics, communications, and electrical power systems of the vehicle are examined and the range of perigee stages with which the vehicle is compatible is given. An overview of the mission and the launch facilities is presented and future markets for commercial satellites are considered. R.B.

A88-51826

ECONOMICS OF SPACE AND THE ROLE OF GOVERNMENT

CHORLEY (House of Lords; Coopers and Lybrand Associates, London, England) Space Policy (ISSN 0265-9646), vol. 4, Aug. 1988, p. 180-186. refs

The industrial and technical case presented to a UK government committee to determine space policy is examined. The arguments concerning the role of government in space development and economic analysis of the benefits from research and analysis are discussed. It is suggested that quantified analysis is usually misleading except in the case of space applications. The question of what commercial and technological benefits a government receives from a space program is considered. R.B.

A88-52317

SPACE CONGRESS, 25TH, COCOA BEACH, FL, APR. 26-29, 1988, PROCEEDINGS

Congress sponsored by the Canaveral Council of Technical Societies. Cape Canaveral, FL, Canaveral Council of Technical

Societies, 1988, 592 p. For individual items see A88-52318 to A88-52373.

Papers are presented dealing with commercial aspects of space, space business, robotics, space station technologies, artificial intelligence applications in space, lunar and Mars exploration concepts, launch vehicles, and systems automation. Topics covered include ground processing of experiments conducted in space, the development of a commercial expendable launch vehicle industry, a small LEO satellite bus, epitaxial thin film growth in space, development of space enterprise, negotiating governmental contracts, robots in Shuttle hardware, telerobotic Space Station applications, simulation of an articulated transporter/manipulator system, welding the Space Station common module prototype, modeling the environment of the Man Tended Free Flyer, and Space Station rapid sample return. Ground operations support by AI, expert system prototype developments, Mars mission profile options and opportunities, launch vehicle operations analyses, space launch systems resiliency, model-based reasoning for knowledge-based software project management, technology advances for Space Shuttle processing, real-time fault management for large-scale systems, information systems for Shuttle processing, orbiter maneuvering vehicle support to the Space Station, and hydrogen-air-steam combustion regimes in large volumes are also discussed. R.B.

A88-53696

ANALYSIS OF R&D PORTFOLIO STRATEGIES FOR CONTRACT COMPETITION

ARI P. J. VEPSALAINEN (Pennsylvania, University, Philadelphia) and GEORGE L. LAURO (General Electric Co., Pittsfield, MA) IEEE Transactions on Engineering Management (ISSN 0018-9391), vol. 35, Aug. 1988, p. 181-186. refs

The authors extend earlier technology assessment methods in two ways. First, multiple attributes of product quality and firm's innovative strength in the respective technologies are viewed in aggregate, so as to balance the R&D portfolio and to maximize the expected returns on the discretionary funds. Second, rational competitor strategies are obtained through simulation based on relative technological capabilities and R&D budgets. Both discrete project portfolios and continuous capabilities and effort levels can be considered. These extensions are illustrated with an example drawn from defense contracting. I.E.

A88-55445*# National Aeronautics and Space Administration, Washington, DC.

ECONOMIC BENEFITS OF COMMERCIAL SPACE ACTIVITIES

BARBARA A. STONE (NASA, Office of Commercial Programs, Washington, DC) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 6 p.
(IAF PAPER 88-566)

This paper discusses the current and potential impact on the economy of selected private sector space activities including materials processing in space and satellite communications. Spacehab, a commercially developed and manufactured pressurized metal cylinder which fits in the Shuttle payload bay and connects to the crew compartment is examined along with potential uses of the Shuttle external tank. Private sector upper stage development, the privatization of expendable launch vehicles, and the transfer of NASA technology are discussed. C.D.

A88-55449*# National Aeronautics and Space Administration, Washington, DC.

NEW INITIATIVES IN THE COMMERCIAL DEVELOPMENT OF SPACE

JAMES T. ROSE and BARBARA A. STONE (NASA, Office of Commercial Programs, Washington, DC) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 8 p.
(IAF PAPER 88-581)

This paper provides a status report on aggressive new initiatives by the NASA Office of Commercial Programs to implement new commercial space policy. The promotion of a strong U.S. commercial presence in space via Spacehab, the Space Shuttle

external tanks, privatization of the Space Station, and the development of commercial remote sensing systems is addressed. The privatization of launch services and the development of a talent base for commercial space efforts are considered. Groups, policies, and plans involved in these developments are discussed.
C.D.

N88-10695# RAND Corp., Santa Monica, CA.
NEW TECHNOLOGIES AND INTELLECTUAL PROPERTY: AN ECONOMIC ANALYSIS

STANLEY M. BESEN May 1987 81 p
(Contract NSF IST-84-15297)
(N-2601-NSF) Avail: NTIS HC A05/MF A01

A greater understanding was developed of how new information and communications technologies may affect the economic system in which knowledge based products and services are created, produced, packaged, distributed, and used. Examined are: (1) the economic basis for the systems of private property rights in intellectual property, copyrights, patents, and trade secrets; (2) the economic behavior of producers of intellectual property; (3) the effects of new technologies on that behavior; (4) the effects of the legal treatment of authors, publishers, packagers, distributors, and users; (5) the issues involved in estimating the harm to producers of intellectual property that results from the introduction of new technologies; and (6) various types of government intervention that may be used to promote the supply of intellectual property.
Author

N88-13087# Office of Technology Assessment, Washington, DC.

TECHNOLOGY TRANSFER TO CHINA

Jul. 1987 249 p
(PB87-223418; OTA-ISC-340; LC-87-619823) Avail: NTIS HC A11/MF A01 CSCL 05A

The Chinese context for technology transfer: The Economic Issues; The Chinese context for technology transfer: Strategies and Issues for technology imports; The role of the United States in technology transfer to China; Policies of other supplier countries: Japan, France, West Germany, and Britain; China's economic and political trends; Strategic implications of a modernizing China; and US policy choices are discussed.
GRA

N88-19381# National Bureau of Standards, Gaithersburg, MD.
STATUS OF EMERGING TECHNOLOGIES: AN ECONOMIC/TECHNOLOGICAL ASSESSMENT TO THE YEAR 2000 Final Report

E. AMBLER Jun. 1987 33 p
(PB88-155775; NBSIR-87/3671) Avail: NTIS HC A03/MF A01 CSCL 05A

The Department of Commerce has concluded, in a review of emerging technologies and their future impacts on the economy, that American businesses lag behind many of their foreign competitors especially the Japanese, in exploiting technological breakthroughs. The review was ordered by Deputy Secretary Clarence J. Brown in April 1986 to identify the new technologies that will lead to new products or processes, analyze their commercialization, and recommend means of reducing the barriers. It is based on assessment by technical experts and agency heads within the Department. They studied scientific and industrial plans and the commercialization process here and abroad. Remarks by Deputy Secretary Brown in releasing the report are included.
Author

N88-19477*# Lockheed Missiles and Space Co., Huntsville, AL. Engineering Center.

PRELIMINARY ANALYSIS OF AN INTEGRATED LOGISTICS SYSTEM FOR OSSA PAYLOADS Final Contractor Report, 15 Sep. 1986 - 15 Apr. 1987

T. PALGUTA, W. BRADLEY, and T. STOCKTON Feb. 1988 104 p
(Contract NAS8-32697)
(NASA-CR-4114; NAS 1.26:4114; LMSC-HEC-TR-D066015)
Avail: NTIS HC A06/MF A01 CSCL 22A

The results of studies of the Office of Space Science and Applications' (OSSA) need for an integrated logistics system to support OSSA payloads, whether attached to the Space Station or free-flying are detailed. An executive summary, the integrated logistics support strategy, preparation of planning documents and a supportability analysis of the 1.8 meter centrifuge are discussed.

N88-19478*# Lockheed Missiles and Space Co., Huntsville, AL. Engineering Center.

PRELIMINARY ANALYSIS OF AN INTEGRATED LOGISTICS SYSTEM FOR OSSA PAYLOADS. VOLUME 1: EXECUTIVE SUMMARY

T. PALGUTA, W. BRADLEY, and T. STOCKTON *In its* Preliminary Analysis of an Integrated Logistics System for OSSA Payloads p 1-23 Feb. 1988

Avail: NTIS HC A06/MF A01 CSCL 22A

The purpose is to describe the logistics study background and approach to providing estimates of logistics support requirements for Office of Space Science and Applications' payloads in the Space Station era. A concise summary is given of the study results. Future logistics support analysis tasks are identified.
Author

N88-19480*# Lockheed Missiles and Space Co., Huntsville, AL. Engineering Center.

PRELIMINARY ANALYSIS OF AN INTEGRATED LOGISTICS SYSTEM FOR OSSA PAYLOADS. VOLUME 3: OSSA INTEGRATED LOGISTICS SUPPORT PLANNING DOCUMENT

T. PALGUTA, W. BRADLEY, and T. STOCKTON *In its* Preliminary Analysis of an Integrated Logistics System for OSSA Payloads p 63-83 Feb. 1988

Avail: NTIS HC A06/MF A01 CSCL 22A

Guidance in preparing and updating an integrated logistics support plan (ILSP) is given. Clear, concise, and detailed instructions are provided on the preparation and content of an ILSP in order to ensure a quality document that reflects total program requirements.
Author

N88-19481*# Lockheed Missiles and Space Co., Huntsville, AL. Engineering Center.

PRELIMINARY ANALYSIS OF AN INTEGRATED LOGISTICS SYSTEM FOR OSSA PAYLOADS. VOLUME 4: SUPPORTABILITY ANALYSIS OF THE 1.8M CENTRIFUGE

T. PALGUTA, W. BRADLEY, and T. STOCKTON *In its* Preliminary Analysis of an Integrated Logistics System for OSSA Payloads p 85-100 Feb. 1988

Avail: NTIS HC A06/MF A01 CSCL 22A

Supportability issues for the 1.8 meter centrifuge in the Life Science Research Facility are addressed. The analysis focuses on reliability and maintainability and the potential impact on supportability and affordability. Standard logistics engineering methodologies that will be applied to all Office of Space Science and Applications' (OSSA) payload programs are outlined. These methodologies are applied to the 1.8 meter centrifuge.
Author

N88-20221*# Kansas Univ., Lawrence.

A COST ANALYSIS FOR THE IMPLEMENTATION OF COMMONALITY IN THE FAMILY OF COMMUTER AIRPLANES, REVISED

TOM CREIGHTON, RAFAEL HADDAD, LOUIS HENDRICH, DOUG HENSLEY, LOUISE MORGAN, MARK RUSSELL, and JERRY SWIFT Apr. 1987 111 p
(Contract NGT-21-002-080)

(NASA-CR-182569; NAS 1.26:182569) Avail: NTIS HC A06/MF A01 CSCL 05C

The acquisition costs determined for the NASA family of commuter airplanes are presented. The costs of the baseline designs are presented along with the calculated savings due to the commonality in the family. A sensitivity study is also presented to show the major drivers in the acquisition cost calculations. The baseline costs are calculated with the Nicolai method. A comparison is presented of the estimated costs for the commuter family with the actual price for existing commuters. The cost calculations for

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the engines and counter-rotating propellers are reported. The effects of commonality on acquisition costs are calculated. The sensitivity calculations of the cost to various costing parameters are shown. The calculations for the direct operating costs, with and without commonality are presented. Author

N88-21085# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, ID.

SPIN OFF BUSINESSES AS MECHANISMS FOR TRANSFERRING TECHNOLOGIES

J. M. WELCH 1987 7 p Presented at the FLC Semi Annual Meeting: Headed for the Future, Sacramento, Calif., 3 Nov. 1987 (Contract DE-AC07-76ID-01570) (DE88-005640; EGG-M-39887; CONF-8711153-1) Avail: NTIS HC A02/MF A01

Federal Laboratories, especially those in rural settings, have the opportunity to participate in local economic development through spin off businesses based on laboratory technologies. Quite often, it is a laboratory employee who is one of the principals in the spin off business. Transferring technology to an employee can add a degree of complexity that is not normally faced in a transfer to an external requestor. Procedures followed at the Idaho National Engineering Laboratory by one of the prime contractors there, EG and G Idaho Inc., are discussed in this article. DOE

N88-21158# Analytic Sciences Corp., Fairborn, OH. ADVANCED AVIONICS SYSTEM ANALYSIS. MODULAR AVIONICS COST BENEFIT STUDY FORMULATION Final Report, Sep. 1983 - Jan. 1986

WILLIAM L. BEDZYK, DONALD R. CZECH, THOMAS J. DICKMAN, FRANK S. GRUBER, and JOHN F. MYERS Feb. 1987 77 p (Contract F33615-83-C-1053) (AD-A189019; TASC-J-5043; AFWAL-TR-87-1138) Avail: NTIS HC A05/MF A01 CSCL 09A

This is a technical baseline for a cost benefit analysis of optional features of an advanced modular avionics architecture for the mid-1990s. It provides an outline of a projected life cycle cost for alternate configurations for future avionics (including cost for implementation and supportability). GRA

N88-22219# Joint Publications Research Service, Arlington, VA. SPACE UTILIZATION PLANS

TETSUHISA SHIRAKAWA *In its* JPRS Report: Science and Technology. Japan p 1-5 3 Mar. 1988 Transl. into ENGLISH from Ceramics Japan (Tokyo, Japan), Apr. 1987 p 262-268 Avail: NTIS HC A05/MF A01

Space utilization used to be an issue in fields such as communications, broadcasting, and meteorology. Such space utilization counts on the high altitudes of artificial satellites. Recently, the additional interest was shown in the utilization of such aspects of the space environment as microgravity and high vacuum. More concretely, interest is present regarding the possibility of material development, e.g., crystal growth, in a microgravitational environment where there is little difference in gravity between different materials and where no thermal convection is caused. Movements in that direction are already active in the United States and Europe. In Japan, space environment utilization is being tackled, regarding it as a field of space utilization, coming after rockets and artificial satellites. The present status of the Japanese space utilization programs is discussed. Author

N88-22676# Colorado Univ., Boulder. Center for Space and Geosciences Policy.

NASA AND THE CHALLENGE OF ISDN: THE ROLE OF SATELLITES IN AN ISDN WORLD Final Report

RADFORD BYERLY, FRANK BARNES, GEORGE CODDING, and JEFFERSON HOFGARD 25 May 1988 67 p (Contract NAGW-1105) (NASA-CR-182749; NAS 1.26:182749) Avail: NTIS HC A04/MF A01 CSCL 12B

To understand what role satellites may play in Integrated Services Digital Network (ISDN), it is necessary to understand the

concept of ISDN, including key organizations involved, the current status of key standards recommendations, and domestic and international progress implementation of ISDN. Each of these areas are explained. A summary of the technical performance criteria for ISDN, current standards for satellites in ISDN, key players in the ISDN environment, and what steps can be taken to encourage application of satellites in ISDN are also covered. Author

N88-22831# Naval Postgraduate School, Monterey, CA. A METHOD FOR ESTIMATING AND CONTROLLING THE COST OF EXTENDING TECHNOLOGY Final Report

WILLIS R. GREER, JR. 10 Mar. 1988 116 p (AD-A190717; NPS54-88-002) Avail: NTIS HC A06/MF A01 CSCL 05C

Both the theoretical and practical aspects of costing extensions of technology are addressed. A method for measuring the level of technology embodied in a system is developed. The increment in technology represented by a development project is found to be highly correlated with development time. Development time is then broken down into normal and abnormal components, which are found to be correlated with development cost. Cost control methods are developed. GRA

N88-25690*# Freibaum (Jerry), Bethesda, MD. INTERNATIONAL AND DOMESTIC MOBILE SATELLITE REGULATORY PROCEEDINGS: A COMPARISON OF OUTCOMES AND DISCUSSION OF IMPLICATIONS

JERRY FREIBAUM *In* Jet Propulsion Lab., Proceedings of the Mobile Satellite Conference p 71(a)-71(f) May 1988 Avail: NTIS HC A23/MF A01 CSCL 17B

It is argued that we are on the threshold of a new multibillion dollar industry that can enhance economic development, dramatically improve disaster assessment and relief operations, improve rural health care and solve many safety and security concerns of the transportation industry. Further delays in resolving conflicts between vested interests will be extremely costly to users, providers and equipment manufacturers. Conference participants are urged to move quickly and decisively towards solving outstanding problems. Author

N88-25691*# International Maritime Satellite Organization, London (England).

MOBILE SATELLITE SERVICES: INTERNATIONAL CO-ORDINATION, CO-OPERATION AND COMPETITION

OLOF LUNDBERG *In* Jet Propulsion Lab., Proceedings of the Mobile Satellite Conference p 71-78 May 1988 Avail: NTIS HC A23/MF A01 CSCL 17B

In the context of a discussion of international cooperation, coordination and competition regarding mobile satellite services, it is asserted that: there will be more than one civil mobile satellite service in the 1990's; competition between these separate mobile satellite systems is inevitable; no system should enjoy monopoly protection or subsidies; and coordination and cooperation are desirable and necessary, since the available L-band spectrum is in short supply. Author

N88-25758*# Transit Communications, Inc., Pasadena, CA.

MOBILE SATELLITE SERVICE IN THE UNITED STATES

CARSON E. AGNEW, JAI BHAGAT, EDWIN A. HOPPER, JOHN D. KIESLING, MICHAEL L. EXNER, LAWRENCE MELILLO, GARY K. NOREEN, and BILLY J. PARROTT (Satellite Mobile Telephone Co.) *In* Jet Propulsion Lab., Proceedings of the Mobile Satellite Conference p 539-544 May 1988 Avail: NTIS HC A23/MF A01 CSCL 17B

Mobile satellite service (MSS) has been under development in the United States for more than two decades. The service will soon be provided on a commercial basis by a consortium of eight U.S. companies called the American Mobile Satellite Consortium (AMSC). AMSC will build a three-satellite MSS system that will offer superior performance, reliability and cost effectiveness for organizations requiring mobile communications across the U.S. The development and operation of MSS in North America is being coordinated with Telesat Canada and Mexico. AMSC expects NASA

to provide launch services in exchange for capacity on the first AMSC satellite for MSAT-X activities and for government demonstrations. Author

N88-26382# Los Alamos National Lab., NM. Earth and Space Science Div.

A BASIS OF SETTLEMENT: ECONOMIC FOUNDATIONS OF PERMANENT PIONEER COMMUNITIES

ERIC M. JONES 1988 17 p Presented at the NASA Symposium on Lunar Bases and Space Activities of the 21st Century, Houston, Tex., 5 Apr. 1988

(Contract W-7405-ENG-36)

(DE88-010907; LA-UR-88-1110-REV; CONF-8804104-1-REV;

PAPER-LBS-88-016) Avail: NTIS HC A03/MF A01

High transport costs will dominate the pattern of lunar development. During the earliest phases, when lunar facilities consist of a research and resource development complex with staff serving tours of a few months, transport costs will encourage local production of food, fuel, and building materials. Once these capabilities are in place and the number of personnel grows to a few hundred, staff rotation might well dominate transport budgets. At that point it would make economic sense to encourage some members of staff to become permanent residents. By analogy with early British settlement in Australia, a vigorous private sector economy could emerge if the lunar organization provided quasi-export earning through its role as the community's major employer and as the major buyer of locally-produced goods. By providing such a market for goods and services, the lunar organization would not only provide a means whereby permanent residents would support themselves but could also accelerate the process of replacing imported goods with local manufactures, thereby reducing the cost of operations. By analogy with recent Alaskan experience, if the resource development activity started making money from sales to orbital customers, severance taxes and or royalty payments could also provide means by which a lunar community could support itself. DOE

N88-29638# Los Alamos National Lab., NM.

NEW DEVELOPMENTS IN CAPITAL COST ESTIMATING

R. A. STUTZ and M. A. ZOCHER 1988 7 p Presented at the 32nd Annual Meeting of the American Association of Cost Engineers and the 10th International Cost Engineering Congress, New York, N.Y., 10 Jul. 1988

(Contract W-7405-ENG-36)

(DE88-005392; LA-UR-88-194; CONF-880728-1) Avail: NTIS HC A02/MF A01

The new developments in cost engineering revolve around the ability to capture information that in the past could not be automated. The purpose of automation is not to eliminate the expert cost engineer. The goal is to use available technology to have more information available to the professionals in the cost engineering field. In that sense, the demand for expertise increases in order to produce the highest quality estimate and project possible from all levels of cost engineers. We cannot overemphasize the importance of using a good source of expert information in building these types of programs. Garbage in, garbage out still applies. Expert systems technology will become commonplace in many vertical markets; it is important to understand what can and cannot be accomplished in the field, and where this technology will lead in the future. DOE

N88-30460# Congressional Research Service, Washington, DC. Science Policy Research Div.

POLITICAL AND ECONOMIC BARRIERS TO INFORMATION TRANSFER

JANE BORTNICK /in AGARD, Barriers to Information Transfer and Approaches Toward Their Reduction 4 p Mar. 1988
Avail: NTIS HC A06/MF A01

As international computer/communications networks proliferate, the issue of limits to information transfer becomes more critical. Individual businesses and even entire industries depend upon the ability to transfer information on a global basis in a timely and cost-effective basis. Additionally, international cooperation in

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science and technology involves greater international collaboration and joint efforts. Barriers that threaten this capability ultimately reduce the growth of markets and limit innovation. For this reason, efforts are underway in bilateral and multinational negotiations to reduce barriers and establish consensus guidelines in areas ranging from privacy to trade. Some of the specific limitations to information transfer, including privacy, trade restrictions, national security, and telecommunications regulations are focused on. It also highlights international efforts to reduce these barriers and establish common approaches to facilitate information transfer. Author

N88-30469# Martin Marietta Corp., Denver, CO. Astronautics Group.

SPACE SYSTEMS COST STUDY Final Report, Sep. 1987 - Feb. 1988

DOUG DILTS and CRAIG MOGENSEN Mar. 1988 195 p

(Contract MDA972-87-C-0005)

(AD-A196024; MCR-88-511) Avail: NTIS HC A09/MF A01

CSSL 22B

The objective was to develop a methodology and automated database/model that would enable DARPA to evaluate low cost satellite programs and appropriate cost reduction approaches. The methodology and results are based on a point conceptual design. For the government to see the appropriate time phased impact, the parametric group recommends that when LIGHTSAT is awarded, an actual characterization be generated and the characterization live with the design and build life cycle. Real-time adjustments and decisions (cost and schedule) can be implemented from DARPASS data to arrive at the lowest possible program cost. GRA

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LOGISTICS AND OPERATIONS MANAGEMENT

Includes Inventory Management and Spare Parts, Materials Management and Handling, Resources Management, Resource Allocation, Procurement Management, Leasing, Contracting and Subcontracting, Maintenance and Repair, Transportation, Air Traffic Control, Fuel Conservation, Operations, Operational Programs.

A88-11880#

POWER AND RESOURCE MANAGEMENT SCHEDULING FOR SCIENTIFIC SPACE PLATFORM APPLICATIONS

AMY L. GEOFFROY, DANIEL L. BRITT, ELLEN A. BAILEY, and JOHN GOHRING (Martin Marietta Corp., Martin Marietta Data Systems Group, Bethesda, MD) IN: IECEC '87; Proceedings of the Twenty-second Intersociety Energy Conversion Engineering Conference, Philadelphia, PA, Aug. 10-14, 1987. Volume 2. New York, American Institute of Aeronautics and Astronautics, 1987, p. 660-664.

The MAESTRO scheduling system designed to handle resource-constrained scheduling problems is described. The MAESTRO system uses activity models, a scheduling period, resource availability profiles, conditions profiles, and an activity list as inputs and a time line of scheduled activities, updated resource availability profiles, evaluations of the computed schedules, and a listing of activities by success level as outputs. The operations of the system are: activity selection, activity placement, resource profile updates, and contingency handling. The user interactions and interface of the system are examined. The effects of strategy selection on the schedule output are investigated, and methods for handling power efficiency under different scheduling scenarios are proposed. I.F.

A88-15286

A MODEL FOR ENVELOPING SPACE STATION LOGISTICS REQUIREMENTS

K. M. SEISER and R. E. GIUNTINI (Wyle Laboratories, El Segundo,

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CA) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 9 p.

Since the inception of the Space Station Customer Logistics Study, it became apparent that a modeling process was needed to provide insight into the many sensitivities and relationships which exist among the numerous variables which impact Space Station customer accommodations and logistics support requirements with regard to their associated design requirements. This paper addresses the current design and operations of the Space Station, with emphasis on the Manufacturing and Technology Laboratory (MTL) which is the primary focus of the study and the model. Typical experiments planned for the MTL are addressed as well as their on-orbit operational and logistical requirements. A detailed description of the model developed under the study along with some of its many applications for scoping Space Station logistics requirements is presented. Author

A88-15585 **UTILITIES SYSTEMS MANAGEMENT - FLYING DEMONSTRATOR**

I. MOIR and P. H. CAPENER (Smiths Industries Aerospace and Defence Systems, Ltd., London, England) IN: Aerospace Avionics Equipment and Integration Conference and Exhibit, Phoenix, AZ, Apr. 23, 24, 1986, Proceedings. Warrendale, PA, Society of Automotive Engineers, Inc., 1986, p. 77-87. (SAE PAPER 860851)

The design and operation of the utilities systems management (USM) hardware developed for the UK Experimental Aircraft Program (EAP) demonstrator are presented in extensive drawings and diagrams and briefly characterized. The USM links the basic aircraft systems (fuel, engine, environmental control, secondary power, hydraulics, etc.) to the avionics or mission bus. It comprises a dedicated MIL-STD-1553B bus, distributed data-acquisition units with local processing and control, an integrated power control, and interfaces with the multifunction displays of the digital cockpit. The overall operation of the USM is outlined; and the system implementation and packaging are discussed. Particular attention is given to the use of relays (rather than solid-state devices) for discrete power switching. When compared to conventional utilities control systems, the USM is shown to provide weight and operating-cost savings of over 50 percent and an eightfold improvement in availability. T.K.

A88-17941 **SOVIET SPACE PROGRAMS - 1980-1985**

NICHOLAS L. JOHNSON San Diego, CA, Univelt, Inc. (Science and Technology Series. Volume 66), 1987, 297 p. refs

A comprehensive overview is given of Soviet space activities and planning during the period 1980-1985, compiling and analyzing information derived from Soviet media releases, Soviet domestic and international technical papers, unclassified satellite tracking data, and Western publications. Chapters are devoted to support systems (launch vehicles and facilities and space surveillance), the major manned and unmanned programs, a chronological record of launches, and the main satellite constellations; each section concludes with a status description as of the end of 1985. Extensive diagrams, drawings, graphs, photographs, and tables of numerical data are provided. T.K.

A88-20785* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

RESULTS OF NASA'S ENERGY EFFICIENT ENGINE PROGRAM

CARL C. CIEPLUCH (NASA, Lewis Research Center, Cleveland, OH), DONALD Y. DAVIS (General Electric Co., Evendale, OH), and DAVID E. GRAY (United Technologies Corp., Pratt and Whitney Div., East Hartford, CT) Journal of Propulsion and Power (ISSN 0748-4658), vol. 3, Nov.-Dec. 1987, p. 560-568. refs

The major activity undertaken in the NASA Energy Efficient Engine Program has been completed. This paper reports on the progress made toward achieving the program goal of developing advanced technology to significantly reduce fuel consumption and

operating costs of future subsonic transport-type propulsion systems. An additional goal was that the advanced concepts be compatible with future environmental regulations. Along with the results obtained, a brief overview of the design details of both the General Electric and Pratt and Whitney energy efficient engines and the overall program scope are presented. Overall, this program has been highly successful; the technology developed during its course is, and will continue to be, effectively employed in both current and future advance transport aircraft engine designs. Author

A88-22793 **IMPLEMENTATION OF THE FLIGHT SAFETY PARTS PROGRAM**

JAMES A. RAY (U.S. Army, Aviation Systems Command, Saint Louis, MO) IN: AHS, Annual Forum, 43rd, Saint Louis, MO, May 18-20, 1987, Proceedings. Volume 2. Alexandria, VA, American Helicopter Society, 1987, p. 915-924.

The U.S. Army Aviation Systems Command has been implementing a Flight Safety Parts Program in conjunction with all Army prime helicopter manufacturers during this past year. This program is designed to provide for improved life cycle management of aircraft parts whose integrity is essential to flight safety. As such, a new approach to enhance quality assurance of the parts has been implemented to cover all phases including manufacturing, transportation, storage, maintenance, operational usage, and overhaul/repair. In addition, the overall safety and functional reliability is being enhanced by direct surveillance analyses and testing of new/used parts on a recurring basis. The purpose of this paper is to define the overall program and to describe the specific details/status of its implementation. Author

A88-23264 **COMPUTER SYSTEMS IN FUTURE ADVANCED AIR TRAFFIC MANAGEMENT**

G. C. HOWELL (Civil Aviation Authority, London, England) IN: Computer applications in aircraft design and operation; Proceedings of the First International Conference on Computer Aided Design, Manufacture and Operation in the Aeronautics and Space Industries, Paris, France, June 16-18, 1987. Billerica, MA, Computational Mechanics Publications, 1987, p. 65-84.

Some typical current ATC systems and existing areas of computer assistance to controllers are described. The role of automation and its relationship with human controllers is discussed, and a possible evolutionary route to the extensive use of automation compatible with flight safety is considered. The use of intelligent knowledge-based systems in future ATC computer systems is discussed, including plans for a U.K. research program in this area. C.D.

A88-23266 **COMPUTER-ASSISTED AIRCRAFT ARRIVALS MANAGEMENT USING SPEED CONTROL**

A. C. F. TYLER (Royal Signals and Radar Establishment, Air Traffic Control Research Div., Malvern, England) IN: Computer applications in aircraft design and operation; Proceedings of the First International Conference on Computer Aided Design, Manufacture and Operation in the Aeronautics and Space Industries, Paris, France, June 16-18, 1987. Billerica, MA, Computational Mechanics Publications, 1987, p. 95-105. refs

This paper introduces the idea of computer assistance in ATC by describing a simple advisory aid which uses control of aircraft speed to produce an orderly flow of aircraft arriving in the terminal area. This results in delays being absorbed more efficiently. An indication is given of the potential use of computer prediction of aircraft trajectories to help controllers handle the arrivals management task in a scenario with increasing traffic flows. C.D.

A88-30775 **UTILITIES MANAGEMENT SYSTEM ON THE EAP DEMONSTRATOR - AIRCRAFT POWER SYSTEM INTEGRATION**

I. MOIR (Smith Industries, PLC, Cheltenham, England), A. G. SEABRIDGE, and J. M. LOWERY (British Aerospace, PLC, Preton, England) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 5-8, 1987. 12 p. refs (SAE PAPER 871780)

An integrated Utilities Management System (UMS) has been developed for the Experimental Aircraft Program demonstrator aircraft. Attention is presently given to the methodology used in the integration of the aircraft power systems into the UMS configuration. The reduction of the number of LRUs associated with the control of utility systems furnishes weight savings for the system as a whole; fault tolerance and access to aircraft systems data are also improved. Installed weight is reduced by 50 percent, operating costs by the same, and availability shows an eightfold improvement. O.C.

A88-32191#

THE EVOLUTION OF FORCE MANAGEMENT TECHNOLOGY

T. F. CHRISTIAN, JR., D. O. HAMMOND, R. S. MESSER (USAF, Warner Robins Air Logistics Center, Robins AFB, GA), and J. B. COCHRAN (Lockheed Aeronautics Systems Co., Marietta, GA) IN: Structures, Structural Dynamics and Materials Conference, 29th, Williamsburg, VA, Apr. 18-20, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 133-137. refs (AIAA PAPER 88-2228)

USAF initiatives throughout the years have produced increasingly more effective methods of force management for individual aircraft and weapon systems. Present emphases are on automation, integration of data from the several Air Force data systems, and display of overall weapon system management information, i.e., functional systems, support, and production maintenance data as well as structural programs data. A computerized Automated Readiness Integrated Engineering System (ARIES) is being developed to provide this function. ARIES accepts data from the Air Force data systems, combines and performs simple operations as desired by the user, and displays the data in formats desired for use at the command level, and the operational level. Author

A88-35094

SPACE STATION PROPULSION (UTILIZATION OF EFFLUENTS FOR OPTIMIZED FLIGHT PROFILES AND STS LOGISTICS CAPABILITIES)

S. M. BRENNAN (Boeing Aerospace Co., Huntsville, AL) IN: Aerospace century XXI: Space flight technologies; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 627-640. Research supported by the Boeing Aerospace Co. (AAS PAPER 86-260)

Logistics-related features are the major contributors to operation costs in the NASA Space Station as a whole and in its propulsion system specifically; attention has accordingly been given to the reduction of the number and weights of such factors, while improving the effectiveness of each Space Shuttle logistic flight to the Space Station in orbit. An economically attractive course involves the use of excess and waste fluids generated aboard both the Shuttle and the Station in a combined O₂/H₂ water electrolysis and resistojet propulsion system. These fluids can be used to fly an optimized, variable-altitude profile that increases Space Shuttle payload-to-orbit capabilities. O.C.

A88-38753#

MAINTAINABILITY - A DESIGN PARAMETER

JAMES E. HOFF (BDM Corp., Albuquerque, NM) IN: AIAA Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 463-468. (AIAA PAPER 88-2184)

This paper discusses maintainability as a design parameter. The discussion is slanted to provide the design engineer with the user perspective of maintainability. It presents the various

maintainability factors that are evaluated by the users operational test and evaluation agency. Author

A88-42333

DEVELOPMENT OF A PROGRAM FOR THE PREPARATION OF AEROSPACE MAINTENANCE PERSONNEL FOR INSPECTION AND REPAIR OF COMPOSITE STRUCTURES

JOHN B. GODWIN, JR. (San Jose State University, CA) IN: Materials - Pathway to the future; Proceedings of the Thirty-third International SAMPE Symposium and Exhibition, Anaheim, CA, Mar. 7-10, 1988. Covina, CA, Society for the Advancement of Material and Process Engineering, 1988, p. 116-123.

An economical method is presented for the manufacture of aerospace composite material test articles used in preparing maintenance personnel for the inspection and repair of structures. Also given is a simple and innovative approach to the solution of problems involving the acquisition of samples of the composite structural elements used in demonstrating repair and inspection techniques. O.C.

A88-42435

INVENTORY BEHAVIOR AT REMOTE SITES

WILLIAM C. LEWIS (Grand Valley State University, Allendale, MI) IN: Materials - Pathway to the future; Proceedings of the Thirty-third International SAMPE Symposium and Exhibition, Anaheim, CA, Mar. 7-10, 1988. Covina, CA, Society for the Advancement of Material and Process Engineering, 1988, p. 1672-1684.

Historical data obtained from NASA Space Shuttle operations are used as the basis of a study concerning prospective inventory behavior aboard the Space Station. The results obtained indicate the likelihood of a high logistics burden for the case in which Space Shuttle technology reliability criteria are applied without suitable modification to the Space Station's design. This technology-carryover will not, in any event, be attempted. Attention is given to the effects of onboard repair capabilities and of extended-length missions on inventory management. O.C.

A88-42912*# Flight Mechanics and Control, Inc., Hampton, VA.

ADVANCED SATELLITE SERVICING FACILITY STUDIES

GARRY D. QUALLS (Flight Mechanics and Control, Inc., Hampton, VA) and MELVIN J. FEREBEE, JR. (NASA, Langley Research Center, Hampton, VA) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 12 p. refs (AIAA PAPER 88-4200)

A NASA-sponsored systems analysis designed to identify and recommend advanced subsystems and technologies specifically for a manned Sun-synchronous platform for satellite management is discussed. An overview of system design, manned and unmanned servicing facilities, and representative mission scenarios are given. Mission areas discussed include facility based satellite assembly, checkout, deployment, refueling, repair, and systems upgrade. The ferrying of materials and consumables to and from manufacturing platforms, deorbit, removal, repositioning, or salvage of satellites and debris, and crew rescue of any other manned vehicles are also examined. Impacted subsystems discussed include guidance navigation and control, propulsion, data management, power, thermal control, structures, life support, and radiation management. In addition, technology issues which would have significant impacts on the system design are discussed. R.B.

A88-43300#

DESIGNING FOR OPERATIONS PRODUCTIVITY ON THE SPACE STATION PROGRAM

G. R. BENNETT and S. G. PADDOCK (McDonnell Douglas Astronautics Co., Space Station Div., Houston, TX) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 8 p. (AIAA PAPER 88-3502)

A systematic approach to operation analysis and the development of an automated Operations Management System (OMS) to enhance productivity and help minimize operation costs for the Space Station are examined. The operation analysis process works with design engineering to derive requirements based on

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operational need, to enhance on-orbit crew productivity, improve flexibility of systems to respond to contingencies with less ground support workarounds, and to integrate all the functions of operation planning and execution. The OMS is a software system which will take care of routine operations both on board and at ground facilities. The OMS will develop, manage, update and execute the Short-Term Plan, monitor the status of space station systems and payloads, manage inter-system and payload testing, maintain and log the station's global configuration, activity and state information, detect and manage resource conflicts, manage the global base caution and warning, perform global base fault management and reconfiguration, support the management of commands and the uplink and downlink of data, provide a global base inventory and maintenance management system and support on-board training and simulations. R.B.

A88-43355

A SIMULATION PROGRAM TO MODEL EFFECTS OF LOGISTICS ON R&M OF COMPLEX SYSTEMS

OFELIA GONZALEZ-VEGA, JOSEPH W. FOSTER, III, and GARY L. HOGG (Texas A & M University, College Station) IN: Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 26-28, 1988, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 306-313. refs

A simulation program (SIMULAV) is presented that is capable of modeling large-scale reliability systems. The program can model the effect of such logistics characteristics as inventory, transportation, and facilities on the reliability and availability of the system. The program is written in Pascal and it consists of three main elements: a process-oriented simulation language, a minimal cut-sets algorithm, and a simulation model to estimate the availability of a complex system. The model is implemented using the process-oriented simulation language and it uses the minimal cut-sets to determine system failure. It assumes that the system can be represented by a reliability block diagram. Examples are modeled to show how SIMULAV can be used to assess the effect of some logistic parameters on the availability of the system. I.E.

A88-43372* Boeing Co., Seattle, WA.

SPACE STATION SYNERGETIC RAM-LOGISTICS ANALYSIS

EDMUND T. DEJULIO (Boeing Co., Seattle, WA) and JOEL H. LEET (NASA, Kennedy Space Center, Cocoa Beach, FL) IN: Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 26-28, 1988, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 410-415.

NASA's Space Station Maintenance Planning and Analysis (MP&A) Study is a step in the overall Space Station Program to define optimum approaches for on-orbit maintenance planning and logistics support. The approach used in the MP&A study and the analysis process used are presented. Emphasis is on maintenance activities and processes that can be accomplished on orbit within the known design and support constraints of the Space Station. From these analyses, recommendations for maintainability/maintenance requirements are established. The ultimate goal of the study is to reduce on-orbit maintenance requirements to a practical and safe minimum, thereby conserving crew time for productive endeavors. The reliability, availability, and maintainability (RAM) and operations performance evaluation models used were assembled and developed as part of the MP&A study and are described. A representative space station system design is presented to illustrate the analysis process. I.E.

A88-43967#

SPACE STATION TOOL KIT

WILLIAM LEWIS (Washington, University, Seattle), DWIGHT WAHLBERG (California, University, La Jolla), and ARCHIE BREEDEN IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 167-170.

Since a module-replacement strategy cannot furnish complete

coverage of all possible system failures on the NASA Space Station, an attempt is presently made to identify those tools that may be most efficiently and with the minimum possible mass employed to undertake component-level repairs and maintenance improvisation. This speculative 'tool kit' is intended to demonstrate the possibility of very general purpose tools, as well as to adumbrate the character of prospective on-orbit repairs. Electrical, electronic, piping, structural, and informational components would be encompassed by the kit. O.C.

A88-50192#

COMPONENT MODEL REDUCTION BY COMPONENT COST ANALYSIS

R. E. SKELTON (Purdue University, West Lafayette, IN), R. SINGH, and J. RAMAKRISHNAN (DYNACS Engineering Co., Inc., Clearwater, FL) IN: AIAA Guidance, Navigation and Control Conference, Minneapolis, MN, Aug. 15-17, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 264-274. refs (AIAA PAPER 88-4086)

Large scale mechanical systems are composed of interconnected dynamic components. This paper seeks to simplify the model of each dynamic component so that the overall system is a manageable size. Models of components are reduced so as to approximate the response of all components and the nonworking constraint forces acting on all components. The technique is an extension of component cost analysis which decompose the norm of the response vector (in this case the response and the vector of nonworking constraint forces) into contributions of each coordinate of each component. In this way the coordinates can be ranked according to their contribution and deleted accordingly. Author

A88-53148#

VEHICLE MANAGEMENT SYSTEMS - THE LOGICAL EVOLUTION OF INTEGRATION

STEVE W. JACOBS (McDonnell Aircraft Co., Saint Louis, MO) and CHARLES A. SKIRA (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, OH) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 24th, Boston, MA, July 11-13, 1988. 9 p. (AIAA PAPER 88-3175)

Vehicle management is the integrated control of the flight, propulsion, and aircraft utility systems. The implementation of this concept into a control architecture forms a Vehicle Management System (VMS). A practical VMS design can provide significant performance and supportability benefits to military aircraft. Performance enhancements are achieved by integrated control to optimize previously independent systems. Supportability is increased through the comprehensive diagnostics, component commonality, and reduced complexity provided by integrated digital systems. This paper reviews the concept of a VMS and addresses the issues of functional and physical integration. A generic approach to VMS design is outlined and illustrated. Key elements for future VMS bench and flight demonstration are also identified. Author

A88-54333#

RECENT ADVANCES IN ENGINE HEALTH MANAGEMENT

KENNETH PIPE and CELIA FISHER (Stewart Hughes, Ltd., Southampton, England) ASME, Gas Turbine and Aeroengine Congress and Exposition, Amsterdam, Netherlands, June 6-9, 1988. 6 p. Research supported by the Ministry of Defence Procurement Executive. (ASME PAPER 88-GT-257)

New measurement capabilities developed in the last five years have greatly enhanced the ability of monitoring systems to produce acceptable engine distress and maintenance information to pilots. The more recent advances are particularly useful for military and helicopter engines. This paper describes three new techniques, with descriptions of their application. These include direct aerodynamic thrust measurement, gas path distress analysis and analysis of the dynamic behavior of gas turbines. The paper concludes by suggesting the impact of these techniques on systems design for future engines. Author

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A88-54852*# National Aeronautics and Space Administration, Washington, DC.

HOW THE STATION WILL OPERATE

JOHN T. COX (NASA, Space Station Program Office, Washington, DC) Aerospace America (ISSN 0740-722X), vol. 26, Sept. 1988, p. 20-22, 27.

Aspects of the upcoming operational phase of the Space Station (SS) are examined. What the crew members will do with their time in their specialized roles is addressed. SS maintenance and servicing and the interaction of the SS Control Center with Johnson Space Center is discussed. The planning of payload operations and strategic planning for the SS are examined. C.D.

A88-55041

COST BENEFITS OF NONDESTRUCTIVE TESTING IN AIRCRAFT MAINTENANCE

DONALD J. HAGEMAIER (Douglas Aircraft Co., Long Beach, CA) Materials Evaluation (ISSN 0025-5327), vol. 46, Sept. 1988, p. 1272, 1274, 1275 (7 ff.). refs

Some specific benefits and cost savings resulting from the effective implementation of nondestructive inspection in conjunction with aircraft maintenance are identified. It is noted that specific costs associated with a given nondestructive test or inspection should be considered in relation to consequential upstream manufacturing costs associated with nondestructive evaluation (e.g., the reduced yield because of the parts that fail tests) and consequential downstream cost savings (e.g., decreased premature removal rate, reduced failure rate, and reduced liability costs). In most situations, these indirect costs are much larger than the direct costs associated with nondestructive testing. The need for developing the engineering and economic methodology to optimize tradeoffs between downstream cost savings and inspection and manufacturing costs is emphasized. V.L.

N88-10782# Transportation Research Board, Washington, DC. **ISSUES IN AIR TRANSPORT AND AIRPORT MANAGEMENT** J. P. SCHWIETERMAN, F. A. SPENCER, M. GHAFOURI, T. N. LAM, and J. R. G. BRANDER 1986 58 p (PB87-204509; TRB/TRR-1094; ISBN-0-309-04114-7; LC-87-7628) Avail: NTIS HC A04/MF A01 CSCL 01C

The six papers in this report deal with the following: alternatives to the hub; a survey of nonstop air service opportunities; accessibility in the deregulated domestic airline network; air transport deregulation and airport congestion; the search for efficient solutions; methodology for planning and operations management of airport terminal facilities; a prescription for efficient management of the Canadian Government's civilian aircraft fleet; and analyzing the financial impact on airports of remote airport ground transportation. GRA

N88-12342*# Research Triangle Inst., Research Triangle Park, NC.

POTENTIAL APPLICATIONS OF EXPERT SYSTEMS AND OPERATIONS RESEARCH TO SPACE STATION LOGISTICS FUNCTIONS

THOMAS F. LIPPIATT and DONALD WATERMAN Jun. 1985 73 p (Contract NAS10-10438) (NASA-CR-180473; NAS 1.26:180473; N-2315-NASA) Avail: NTIS HC A04/MF A01 CSCL 12B

The applicability of operations research, artificial intelligence, and expert systems to logistics problems for the space station were assessed. Promising application areas were identified for space station logistics. A needs assessment is presented and a specific course of action in each area is suggested. B.G.

N88-12970# Eurocontrol Experimental Centre, Bretigny (France).

EXPERIMENTAL USE OF ARTIFICIAL INTELLIGENCE FOR (FUTURE) ATC SYSTEMS

F. KRELLA 15 Sep. 1986 52 p (PB87-106449; EEC/NOTE-15/86) Avail: NTIS HC E04/MF E04 CSCL 09B

An expert system shell and an expert system were implemented on an IBM compatible mainframe computer. The expert system represents a planning position of an air traffic controller suite, where aircraft conflicts are resolved prior to entry in a control zone by height separation. The expert system's findings are represented on a graphical screen. The planning position corresponds to an implementation made for a real time simulation, CAPE, the computer aided planning experiment. GRA

N88-14990# Computer Resource Management, Inc., Vienna, VA.

CHICAGO'S O'HARE RUNWAY CONFIGURATION MANAGEMENT SYSTEM (RCMS). VOLUME 1: DESCRIPTION OF THE OPERATIONAL SOFTWARE

ANTHONY BRADLEY, HELEN MONK, and EDWARD JAGGARD Jul. 1987 94 p (Contract DTFA03-85-C-00046) (AD-A185886; DOT/FAA/CT-86/15-1) Avail: NTIS HC A05/MF A01 CSCL 01E

Volume I of this report describes the proposed Runway Configuration Management System (RCMS) operational software for review by the facility personnel. It also serves as an input to RCMS functional specifications for the Traffic Management System (TMS) program. Using interactive computer logic, RCMS helps supervisors select runway configurations which reduce aircraft delays by optimizing throughput capacity in dynamic operational environments. Author (GRA)

N88-15783# Computer Resource Management, Inc., Vienna, VA.

CHICAGO'S O'HARE RUNWAY CONFIGURATION MANAGEMENT SYSTEM (RCMS). VOLUME 2: USERS GUIDE

ANTHONY BRADLEY, HELEN MONK, and EDWARD JAGGARD Jul. 1987 113 p (Contract DTFA03-85-C-00046) (AD-A186222; DOT/FAA/CT-86/15-2) Avail: NTIS HC A06/MF A01 CSCL 01E

Volume I of this report describes the proposed Runway Configuration Management System (RCMS) operational software for review by the facility personnel. It also serves as an input to RCMS functional specifications for the Traffic Management System (TMS) program. Using interactive computer logic, RCMS helps supervisors select runway configurations which reduce aircraft delays by optimizing throughput capacity in dynamic operational environments. Volume II of this report is the User's Guide to the RCMS. Author (GRA)

N88-16427*# Computer Sciences Corp., Beltsville, MD. System Sciences Div.

THE RESOURCE ENVELOPE AS A BASIS FOR SPACE STATION MANAGEMENT SYSTEM SCHEDULING

JOY BUSH and ANNA CRITCHFIELD In NASA, Marshall Space Flight Center, Third Conference on Artificial Intelligence for Space Applications, Part 1 p 377-381 Nov. 1987 (Contract NAS5-28620) Avail: NTIS HC A18/MF A01 CSCL 09B

The Platform Management System (PMS) Resource Envelope Scheduling System (PRESS) expert system prototype developed for space station scheduling is described. The purpose of developing the prototype was to investigate the resource envelope concept in a practical scheduling application, using a commercially available expert system shell. PRESS is being developed on an IBM PC/AT using Teknowledge, Inc.'s M.1 expert system shell. Author

N88-16699*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, OH.

LEWIS MATERIALS RESEARCH AND TECHNOLOGY: AN OVERVIEW

SALVATORE J. GRISAFFE In its Aeropropulsion '87. Session 1: Aeropropulsion Materials Research 8 p Nov. 1987 Avail: NTIS HC A06/MF A01 CSCL 05A

The Materials Division at the Lewis Research Center has a

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long record of contributions to both materials and process technology as well as to the understanding of key high-temperature phenomena. An overview of the division staff, facilities, past history, recent progress, and future interests is presented. Author

N88-18598# Army Construction Engineering Research Lab., Champaign, IL.

MICRO PAVER CONCEPT AND DEVELOPMENT AIRPORT PAVEMENT MANAGEMENT SYSTEM Final Report

MOHAMED Y. SHAHIN, KATHRYN A. CATION, and MARGARET R. BROTEN Jul. 1987 43 p
(Contract DTFA01-86-Z-02040)
(AD-A187360; CERL-TR-M-87/12; DOT/FAA/PM-87/8) Avail:
NTIS HC A03/MF A01 CSCL 05A

Micro PAVER is a microcomputer version of the PAVER Pavement Maintenance Management System. PAVER is a field-tested, validated pavement maintenance management for airports, cities, counties, and military installations which is designed to optimize the funds allocated for pavement maintenance and rehabilitation (M and R). This report discusses the development of the Micro PAVER program and its capabilities in the areas of pavement network inventory, project prioritization, inspection scheduling, determining present and future network condition, determining maintenance and rehabilitation needs, budget planning, and economic analysis. The Micro PAVER technology is based on the Pavement Condition Index (PCI) survey and rating procedure developed at USA-CERL. The PCI, which is a numerical index from 0 to 100, is a measure of the pavement's structural integrity and operational condition and is computed as a function of distress type, severity, and quantity. The PCI provides an objective and consistent measure of pavement condition. Micro PAVER provides data and procedures for practical decisionmaking to identify cost-effective maintenance and rehabilitation needs for roads, streets, parking lots, and airfield pavements. GRA

N88-19479*# Lockheed Missiles and Space Co., Huntsville, AL. Engineering Center.

PRELIMINARY ANALYSIS OF AN INTEGRATED LOGISTICS SYSTEM FOR OSSA PAYLOADS. VOLUME 2: OSSA INTEGRATED LOGISTICS SUPPORT STRATEGY

T. PALGUTA, W. BRADLEY, and T. STOCKTON *In its Preliminary Analysis of an Integrated Logistics System for OSSA Payloads p* 25-61 Feb. 1988

Avail: NTIS HC A06/MF A01 CSCL 22A

The purpose is to outline an Office of Space Science and Applications (OSSA) integrated logistics support strategy that will ensure effective logistics support of OSSA payloads at an affordable life-cycle cost. Program objectives, organizational relationships, and implementation of the logistics strategy are discussed. Author

N88-20202*# National Academy of Engineering, Washington, DC. Committee on Shuttle Criticality Review and Hazard Analysis Audit.

POST-CHALLENGER EVALUATION OF SPACE SHUTTLE RISK ASSESSMENT AND MANAGEMENT

Jan. 1988 150 p
(Contract NASW-4003)
(NASA-CR-182461; NAS 1.26:182461; PB88-190624) Avail:
NTIS HC A07/MF A01 CSCL 05A

As the shock of the Space Shuttle Challenger accident began to subside, NASA initiated a wide range of actions designed to ensure greater safety in various aspects of the Shuttle system and an improved focus on safety throughout the National Space Transportation System (NSTS) Program. Certain specific features of the NASA safety process are examined: the Critical Items List (CIL) and the NASA review of the Shuttle primary and backup units whose failure might result in the loss of life, the Shuttle vehicle, or the mission; the failure modes and effects analyses (FMEA); and the hazard analysis and their review. The conception of modern risk management, including the essential element of objective risk assessment is described and it is contrasted with NASA's safety process in general terms. The discussion, findings,

and recommendations regarding particular aspects of the NASA STS safety assurance process are reported. The 11 subsections each deal with a different aspect of the process. The main lessons learned by SCRHAAC in the course of the audit are summarized. B.G.

N88-24576# Federal Aviation Administration, Atlantic City, NJ. Office of Aviation Policy and Plans.

FAA AVIATION FORECASTS FISCAL YEARS 1988-1999

Feb. 1988 195 p
(AD-A191711; FAA-APO-88-1) Avail: NTIS HC A09/MF A01 CSCL 01A

This report contains Fiscal Years 1988-1999 FAA forecasts of aviation activity at FAA facilities. These include airports with FAA control towers, air route traffic control centers, and flight service stations. Detailed forecasts were made for the four major users of the National Aviation System: air carriers, air taxi/commuters, general aviation and the military. The forecasts have been prepared to meet the budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, by the aviation industry, and by the general public. The overall outlook for the forecast period is for continued economic growth, rising real fuel prices, and moderate inflation. Based upon these assumptions, aviation activity by fiscal year 1999 is forecast to increase by 33.4 percent at towered airports, 33.5% at air route traffic control centers, and 11.7% in flight services performed. Hours flown by general aviation are forecast to increase 6.1% and helicopter hours flown, 33.3%. Scheduled domestic revenue passenger miles (RPMs) are forecast to increase by 81.3%, and regionals/commuters by 16.9% percent. Scheduled domestic revenue passenger miles (RPM's) are forecast to increase 75.8 percent, with scheduled international RPM's forecast to increase by 81.3 percent, and regionals/commuters RPM's forecast to increase by 16.9 percent. GRA

N88-25453*# Systems Control Technology, Inc., Arlington, VA. ZERO/ZERO ROTORCRAFT CERTIFICATION ISSUES.

VOLUME 1: EXECUTIVE SUMMARY Final Report

RICHARD J. ADAMS Jul. 1988 33 p
(Contract NAS2-12478)
(NASA-CR-177483-VOL-1; NAS 1.26:177483-VOL-1;
DOT/FAA/PS-88/8-VOL-1; DOT/FAA/DS-88/2-VOL-1) Avail:
NTIS HC A03/MF A01 CSCL 01C

This report analyzes the Zero/Zero Rotorcraft Certification Issues from the perspectives of manufacturers, operators, researchers and the FAA. The basic premise behind this analysis is the zero/zero, or at least extremely low visibility, rotorcraft operations are feasible today from both a technological and an operational standpoint. The questions and issues that need to be resolved are: What certification requirements do we need to ensure safety. Can we develop procedures which capitalize on the performance and maneuvering capabilities unique to rotorcraft. Will extremely low visibility operations be economically feasible. This is Volume 1 of three. It provides an overview of the Certification Issues Forum held in Phoenix, Arizona in August of 1987. It presents a consensus of 48 experts from government, manufacturer, and research communities on 50 specific Certification Issues. The topics of Operational Requirements, Procedures, Airworthiness, and Engineering Capabilities are discussed. Author

N88-25454*# Systems Control Technology, Inc., Arlington, VA. ZERO/ZERO ROTORCRAFT CERTIFICATION ISSUES.

VOLUME 2: PLENARY SESSION PRESENTATIONS Final Report

RICHARD J. ADAMS Jul. 1988 84 p
(Contract NAS2-12478)
(NASA-CR-177483-VOL-2; NAS 1.26:177483-VOL-2;
DOT/FAA/DS-88/2-VOL-2; DOT/FAA/PS-88/8-VOL-2) Avail:
NTIS HC A05/MF A01 CSCL 01C

This report analyzes the Zero/Zero Rotorcraft Certification Issues from the perspectives of manufacturers, operators, researchers and the FAA. The basic premise behind this analysis is that zero/zero, or at least extremely low visibility, rotorcraft

operations are feasible today from both a technological and an operational standpoint. The questions and issues that need to be resolved are: What certification requirements do we need to ensure safety. Can we develop procedures which capitalize on the performance and maneuvering capabilities unique to rotorcraft. Will extremely low visibility operations be economically feasible. This is Volume 2 of three. It presents the operator perspectives (system needs), applicable technology and zero/zero concepts developed in the first 12 months of research of this project. Author

N88-25455*# Systems Control Technology, Inc., Arlington, VA.
ZERO/ZERO ROTORCRAFT CERTIFICATION ISSUES.
VOLUME 3: WORKING GROUP RESULTS Final Report
 RICHARD J. ADAMS Jul. 1988 62 p
 (Contract NAS2-12478)
 (NASA-CR-177483-VOL-3; NAS 1.26:177483-VOL-3;
 DOT/FAA/DS-88/2-VOL-3; DOT/FAA/PS-88/8-VOL-3) Avail:
 NTIS HC A04/MF A01 CSCL 01C

This report analyzes the Zero/Zero Rotorcraft Certification Issues from the perspectives of manufacturers, operators, researchers and the FAA. The basic premise behind this analysis is that zero/zero, or at least extremely low visibility, rotorcraft operations are feasible today from both a technological and an operational standpoint. The questions and issues that need to be resolved are: What certification requirements do we need to ensure safety. Can we develop procedures which capitalize on the performance and maneuvering capabilities unique to rotorcraft. Will extremely low visibility operations be economically feasible. This is Volume 3 of three. It provides the issue-by-issue deliberations of the experts involved in the Working Groups assigned to deal with them in the Issues Forum. Author

N88-25470*# National Aeronautics and Space Administration.
 Lewis Research Center, Cleveland, OH.
WEIGHT SAVINGS IN AEROSPACE VEHICLES THROUGH PROPELLANT SCAVENGING
 STEVEN J. SCHNEIDER and BRIAN D. REED 1988 25 p
 Presented at the 47th Annual Conference on Mass Properties Engineering, Plymouth, Mich., 23-25 May 1988; sponsored by the Society of Allied Weight Engineers, Inc.
 (NASA-TM-100900; E-4079; NAS 1.15:100900; SAWE-1818)
 Avail: NTIS HC A03/MF A01 CSCL 22B

Vehicle payload benefits of scavenging hydrogen and oxygen propellants are addressed. The approach used is to select a vehicle and a mission and then select a scavenging system for detailed weight analysis. The Shuttle 2 vehicle on a Space Station rendezvous mission was chosen for study. The propellant scavenging system scavenges liquid hydrogen and liquid oxygen from the launch propulsion tankage during orbital maneuvers and stores them in well insulated liquid accumulators for use in a cryogenic auxiliary propulsion system. The fraction of auxiliary propulsion propellant which may be scavenged for propulsive purposes is estimated to be 45.1 percent. The auxiliary propulsion subsystem dry mass, including the proposed scavenging system, an additional 20 percent for secondary structure, an additional 5 percent for electrical service, a 10 percent weight growth margin, and 15.4 percent propellant reserves and residuals is estimated to be 6331 kg. This study shows that the fraction of the on-orbit vehicle mass required by the auxiliary propulsion system of this Shuttle 2 vehicle using this technology is estimated to be 12.0 percent compared to 19.9 percent for a vehicle with an earth-storable bipropellant system. This results in a vehicle with the capability of delivering an additional 7820 kg to the Space Station. Author

N88-28002# British Airways, Heathrow (England).
ENGINE CONDITION MONITORING CIVIL REQUIREMENTS: A BRITISH AIRWAYS VIEW
 A. W. TICHBON *In* DFVLR, Proceedings of the 14th Symposium on Aircraft Integrated Monitoring Systems p 9-26 Jan. 1988
 Avail: NTIS HC A99/MF A01; DFVLR, VB-PL-DO, 90 60 58, 5000 Cologne, Fed. Republic of Germany 160 Deutsche marks
 Engine condition monitoring activities are reviewed. The size

and complexity in handling the turbine engine operation together with the magnitude of costs involved are presented. Monitoring techniques are listed. Monitoring oil wetted components, gas path analysis, and vibration trending are discussed. Areas where efforts should be concentrated to improve the overall effectiveness of engine condition monitoring are indicated. ESA

N88-28005# Stewart Hughes Ltd., Southampton (England).
RECENT ADVANCES IN ENGINE HEALTH MANAGEMENT
 K. PIPE *In* DFVLR, Proceedings of the 14th Symposium on Aircraft Integrated Monitoring Systems p 73-97 Jan. 1988
 Avail: NTIS HC A99/MF A01; DFVLR, VB-PL-DO, 90 60 58, 5000 Cologne, Fed. Republic of Germany 160 Deutsche marks

The problem of extracting an accurate prognosis for the data available in aircraft engine health management, and establishing a practical management system for the types of monitoring system required to support the analysis techniques are reviewed. Computer and statistical techniques for solving these problems are outlined. The use of representational models in pattern matching approaches is emphasized. The advantages of using an expert system to fully exploit all the monitoring information available are underlined. The need to translate data into a form meaningful to maintenance and plant engineers is stressed. ESA

N88-29187# Integrated Support Systems, Inc., Clemson, SC.
RELIABILITY AND MAINTAINABILITY (R AND M) Interim Report, Mar. - May 1988
 ROBERT J. HANKINS May 1988 62 p
 (Contract F33615-84-C-0061)
 (AD-A193857; AFHRL-TP-87-37) Avail: NTIS HC A04/MF A01 CSCL 15E

This paper details an Air Force Reliability and Maintainability (R and M) study which investigated the degree to which R and M logistics analyses requirements are satisfied by the Unified Data Base (UDB) for Logistics Information, a fully automated on-line interactive logistic Support Analysis Record system. The R and M study consisted of three sequential tasks: (1) investigation and definition of requirements, (2) definition of the frequency and method of specific R and M data collection, and (3) performance of comparability analyses of data elements defined in the first task and currently in the UDB. This paper includes a detailed description of the procedures followed and results of each task and provides recommendations for incorporation into the UDB. GRA

N88-29383*# Martin Marietta Aerospace, Denver, CO.
A SCHEDULING AND RESOURCE MANAGEMENT SYSTEM FOR SPACE APPLICATIONS
 DANIEL L. BRITT, AMY L. GEOFFROY, and JOHN R. GOHRING
In NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 303-310 Aug. 1988
 Avail: NTIS HC A99/MF E03 CSCL 05A

Every spacecraft, whether in orbit around the earth or on a deep space flight, has at its disposal limited amounts of the resources for it to accomplish its mission. Activity scheduling is currently a costly, human intensive task which requires a great deal of expertise. It belongs to a class of problems whose complexity increases exponentially with the number of operations. NASA has in the past accomplished this task by using a great deal of manpower, a large number of negotiating sessions, interminable bouts of phone tag, and mountains of paperwork. Lately the situation has improved with the introduction of automated scheduling techniques, but these to date still require expert involvement and fall short in some important ways. A prototype activity scheduler, MAESTRO, is introduced which is capable of

meeting the needs of many NASA missions, eventually to include the Space Station. The approach to resource constrained scheduling is first discussed, then the intended domain for MAESTRO is described along with its design and current capabilities. A description of planned enhancements and revisions to the systems is also presented.

Author

N88-29407*# Boeing Aerospace Co., Huntsville, AL. Space Station.

A ROBOTIC SYSTEM FOR AUTOMATION OF LOGISTICS FUNCTIONS ON THE SPACE STATION

J. C. MARTIN, R. B. PURVES, R. N. HOSIER, and B. A. KREIN (Westinghouse Mfg. Systems and Technology Center, Columbia, Md.) *In* NASA, Marshall Space Flight Center, Second Conference on Artificial Intelligence for Space Applications p 503-511 Aug. 1988

Avail: NTIS HC A99/MF E03 CSCL 09B

Spacecraft inventory management is currently performed by the crew and as systems become more complex, increased crew time will be required to perform routine logistics activities. If future spacecraft are to function effectively as research labs and production facilities, the efficient use of crew time as a limited resource for performing mission functions must be employed. The use of automation and robotics technology, such as automated warehouse and materials handling functions, can free the crew from many logistics tasks and provide more efficient use of crew time. Design criteria for a Space Station Automated Logistics Inventory Management System is focused on through the design and demonstration of a mobile two armed terrestrial robot. The system functionally represents a 0 gravity automated inventory management system and the problems associated with operating in such an environment. Features of the system include automated storage and retrieval, item recognition, two armed robotic manipulation, and software control of all inventory item transitions and queries.

Author

N88-30342*# Ford Aerospace and Communications Corp., College Park, MD.

INTEGRATED RESOURCE SCHEDULING IN A DISTRIBUTED SCHEDULING ENVIRONMENT

DAVID ZOCH and GARDINER HALL *In* NASA, Goddard Space Flight Center, The 1988 Goddard Conference on Space Applications of Artificial Intelligence p 155-172 Aug. 1988

Avail: NTIS HC A19/MF A01 CSCL 09B

The Space Station era presents a highly-complex multi-mission planning and scheduling environment exercised over a highly distributed system. In order to automate the scheduling process, customers require a mechanism for communicating their scheduling requirements to NASA. A request language that a remotely-located customer can use to specify his scheduling requirements to a NASA scheduler, thus automating the customer-scheduler interface, is described. This notation, Flexible Envelope-Request Notation (FERN), allows the user to completely specify his scheduling requirements such as resource usage, temporal constraints, and scheduling preferences and options. The FERN also contains mechanisms for representing schedule and resource availability information, which are used in the inter-scheduler inconsistency resolution process. Additionally, a scheduler is described that can accept these requests, process them, generate schedules, and return schedule and resource availability information to the requester. The Request-Oriented Scheduling Engine (ROSE) was designed to function either as an independent scheduler or as a scheduling element in a network of schedulers. When used in a network of schedulers, each ROSE communicates schedule and resource usage information to other schedulers via the FERN notation, enabling inconsistencies to be resolved between schedulers. Individual ROSE schedules are created by viewing the problem as a constraint satisfaction problem with a heuristically guided search strategy.

Author

RELIABILITY AND QUALITY CONTROL

Includes Fault Tolerance, Failure and Error Analysis, Reliability Engineering, Quality Assurance, Wear, Safety Management and Safety, Standards and Measurement, Tests and Testing Inspections, Specifications, Performance Tests, Certification.

A88-11783*# National Aeronautics and Space Administration, Washington, DC.

NASA AEROSPACE BATTERY SYSTEM PROGRAM INITIATION

NORMAN R. SCHULZE (NASA, Washington, DC) *IN*: IECEC '87; Proceedings of the Twenty-second Intersociety Energy Conversion Engineering Conference, Philadelphia, PA, Aug. 10-14, 1987. Volume 1. New York, American Institute of Aeronautics and Astronautics, 1987, p. 48-51.

Preflight and flight battery system problems in flight programs at NASA created high-level concern and interest in the current battery technology status. As a result, NASA conducted an in-house review of problems experienced both internally and by other government users. The derived issues which encompassed the programmatic scope from cell manufacturing to in-flight operations of the system are discussed. From the identified deficiencies, a modestly scaled battery program was established to alleviate or minimize the risks of future occurrences.

Author

A88-13376

SAFE ASSOCIATION, ANNUAL SYMPOSIUM, 24TH, SAN ANTONIO, TX, DEC. 11-13, 1986, PROCEEDINGS

Newhall, CA, SAFE Association, 1987, 310 p. For individual items see A88-13377 to A88-13413.

(AD-A199275)

Various papers on safety systems are presented. The topics addressed include: limb flail injuries in USAF ejections, decompression tests of personal flight equipment, simulation of a highly dynamic G-time profile, computer simulation of manikin head-neck system, CREST system design, CREST restraint system development program, CREST seat structure development, CREST windblast protection system design, development of the true human analog ADAM, Koch emergency egress lighting systems, Space Shuttle Orbiter ejection seat survey, Mk15 ejection seat, aircraft passenger protection from smoke and fire, CREST flight controller, and NACES program and seat. Also discussed are: RU-36/P HELO emergency egress device, H-46 helicopter emergency flotation system, ADAM data acquisition system, emergency command recognizer for voiced system control, decompression sickness and venous gas emboli, mechanical analog of the human dynamic spin/viscera, delayed ejection, biodynamics data bank, laser fiber optic initiation system, inductively coupled initiator, and mental and physical performance at low core temperatures.

C.D.

A88-16189#

EARTH SAFETY AND DISASTER RESPONSE EMPLOYING SPACE-BORNE SYSTEMS - A REVIEW

U. R. RAO, J. P. SINGH, and Y. S. RAJAN (Indian Space Research Organization, Bangalore, India) *IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987. 20 p.* (IAF PAPER 87-578)

Space service applications relevant to disaster and distress management are discussed. Disaster warning and disaster relief are defined, and the roles in these areas of Inmarsat, Cospas-Sarsat, and other satellites are described. A detailed description of satellite-based disaster warning and relief support in India is given.

C.D.

A88-18582

RELIABILITY ENGINEERING

P. D. T. O'CONNOR, ED. (British Aerospace, PLC, Army Weapons Div., Stevenage, England) Washington, DC, Hemisphere Publishing

Corp., 1988, 319 p. No individual items are abstracted in this volume.

Reliability is formally defined as the probability that an item will survive without failure for a stated period of time, under stated conditions of use; probability and statistics accordingly furnish the basis for much of reliability theory. The present conference gives attention to mathematical techniques, system reliability modeling and design, reliability in mechanical and electronic components and systems, reliability assessments for microelectronics, process plant reliability, the reliability analysis of distributed systems, a case history of weapon reliability, and the management of reliability. O.C.

A88-18658#

RAMJET DEVELOPMENT TESTING - ARE WE DOING IT RIGHT?

FRANK F. WEBSTER (Martin Marietta Corp., Orlando, FL) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 23rd, San Diego, CA, June 29-July 2, 1987. 17 p. (AIAA PAPER 87-2185)

Ramjet propulsion systems evolved into a modern era starting in the mid 1960's with the advent of the Integral Rocket/Ramjet concept. At least ten different liquid fueled ramjet propulsion arrangements for missiles have been development tested during this period with three concepts having proceeded through flight testing. This paper identifies the problems and pitfalls discovered during those development programs. An overview is given of the various ramjet propulsion systems which have been evaluated in test programs. The various testing techniques are summarized along with the major difficulties that were encountered. Recommendations are made for essential test procedures and hardware arrangements. A comparison is made of the different types of propulsion arrangements and how required testing programs may vary among configurations. Author

A88-22405*# Wyle Labs., Inc., Huntsville, AL. EXPERIMENTS TO ENSURE SPACE STATION FIRE SAFETY - A CHALLENGE

W. W. YOUNGBLOOD and K. M. SEISER (Wyle Laboratories, Inc., Huntsville, AL) AIAA, Aerospace Sciences Meeting, 26th, Reno, NV, Jan. 11-14, 1988. 10 p. refs (Contract NAS3-25067) (AIAA PAPER 88-0540)

Three experiments have been formulated in order to address prominent fire safety requirements aboard the NASA Space Shuttle; these experiments are to be conducted as part of a Space Station-based Technology Development Mission for the growth phase of Space Station construction and operation. The experiments are: (1) an investigation of the flame-spread rate and combustion-product evolution in the burning of typical spacecraft materials in low gravity; (2) an evaluation of the interaction of fires and candidate fire extinguishers in low gravity; and (3) an investigation of the persistence and propagation of smoldering and deep-seated combustion in low gravity. O.C.

A88-26175* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EUROPEAN/U.S. COOPERATIVE FLIGHT TESTING - SOME FOOD FOR THOUGHT

RONALD M. GERDES (NASA, Ames Research Center, Moffett Field, CA) Cockpit (ISSN 0742-1508), July-Sept. 1987, p. 4-9.

Increasing numbers of flight test teams are participating in cooperative European/U.S. flight test programs due to the growth in international aircraft R&D. Preparing for and participating in these overseas assignments can be complicated by such factors as language barriers, unfamiliar flight test procedures, lack of adequate flight experience and unexpected weather trends. A visiting test pilot's checklist is presented which outlines the tasks of the various phases (i.e., concept, planning, preparation, execution, analysis, and data presentation). K.K.

A88-30975* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NASA SMALL CIVIL AIRPLANE RESEARCH

H. PAUL STOUGH, III and BRUCE J. NOLMES (NASA, Langley Research Center, Hampton, VA) SAE, International Pacific Air and Space Technical Conference, Melbourne, Australia, Nov. 13-17, 1987. 17 p. refs (SAE PAPER 872404)

NASA-Langley's ongoing research programs on behalf of performance, safety, and utility enhancements for small civil aircraft have over the last decade introduced important advancements in natural laminar flow inducement and stall/spin recovery and prevention. The achievability and maintainability of natural laminar flow has led to performance improvements of as much as 25 percent. Recent research has improved predictive techniques for aircraft stall/spin characteristics, and also led to the development of a wing leading edge design for enhanced spin resistance. O.C.

A88-31083

DESIGN FEATURES OF EXCIMER LASERS FOR SAFE OPERATION IN INDUSTRY AND MEDICINE

Z. M. ALVI (Northrop Corp., Hawthorne, CA) IN: Lasers '86; Proceedings of the Ninth International Conference on Lasers and Applications, Orlando, FL, Nov. 3-7, 1986. McLean, VA, STS Press, 1987, p. 646-553. refs

The built-in safety aspects of high-energy excimer lasers designed for use in the aerospace industry are discussed as well as those of low-energy excimer lasers applied in surgery and medicine. High-energy lasers require isolated enclosed facilities such as a properly shielded remote room having a variety of interlocks. Moreover, excimers require the use of dangerous gas mixtures, a preionization subsystem, and a Raman cell for frequency down-shifting. The use of a shielded cone or a collimator would reduce the ionizing radiation exposure within the nominal hazard zone region surrounding the laser head. K.K.

A88-38701

AIAA FLIGHT TEST CONFERENCE, 4TH, SAN DIEGO, CA, MAY 18-20, 1988, TECHNICAL PAPERS

Conference sponsored by AIAA. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, 563 p. For individual items see A88-38702 to A88-38763.

The present conference discusses NASA Ames-Dryden Flight Research Facility aircraft flight flutter testing, the Radarbet expert system-based multiple trajectory estimator, numerical filtering techniques for noise reduction in digital telemetry, 'skunk works' prototyping, the NASA Integrated Test Facility and its impact on flight research, a flight test approach to pilot workload assessment, AFTI/F-111 Mission Adaptive Wing flight research, the European Fighter Aircraft program, and a real-time aerodynamic analysis system for use in flight. Also discussed are stability flight test verification by modal separation, air-to-air combat development of the AH-64A Apache, a Space Shuttle crew escape tube study, a real-time flight performance analysis technique for the X-29A, a National Space Test Range, diagnostics design requirements for integrated avionics subsystems, maintainability as a design parameter, the tactical significance of helicopter aerobatics, and the development of a mobile flight test support facility. O.C.

A88-38711*# National Aeronautics and Space Administration. Flight Research Center, Edwards, CA.

THE NASA INTEGRATED TEST FACILITY AND ITS IMPACT ON FLIGHT RESEARCH

D. A. MACKALL, M. D. PICKETT, L. J. SCHILLING, and C. A. WAGNER (NASA, Flight Research Center, Edwards, CA) IN: AIAA Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988, Technical Papers. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 85-97. refs (AIAA PAPER 88-2095)

NASA-Ames' Integrated Test Facility (ITF), when completed, will provide ground test facilities for the safe and efficient testing of advanced research aircraft with fully integrated flight control,

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propulsion systems, structures, and aerodynamic configurations. Flight test risk will be minimized through the reduction of differences between flight and ground test environments; the latter will involve the interfacing of real-time flight simulation with the actual aircraft through a simulation-interface device. The test process and the collection and management of test data will be automated. Attention is given to preliminary ITF results for the X-29 aircraft. O.C.

A88-40250#

COMPUTER AIDED REQUIREMENTS MANAGEMENT SYSTEM (CARMS) AND FLIGHT TEST

K. M. MORGER (McDonnell Douglas Helicopter Co., Mesa, AZ) AIAA, Flight Test Conference, 4th, San Diego, CA, May 18-20, 1988. 6 p.
(AIAA PAPER 88-2091)

The CARMS approach to managing requirements can be used for flight testing as well as the rest of an aircraft's life cycle. CARMS offers traceability of design trade-offs and decisions, current project status, and component interactions. CARMS can be used to catch problem areas before the flight testing begins and before many potentially costly mistakes are made on the production fleet. K.K.

A88-40524

SIMULATION - ANTIDOTE TO RISK

LEE DAY and GRAHAM SPEED (Singer Link-Miles, Ltd., Lancing, England) Spaceflight (ISSN 0038-6340), vol. 30, June 1988, p. 240-243.

The use of simulators to reduce risk in space programs is discussed. Simulation is used in system verification during the early phases of a project to substitute for missing system elements, allowing for verification of the overall system design, so that modifications can be made before hardware is manufactured. The new focus in developing simulators is on training analysis to provide a system tailored to the tasks and characteristics of trainees. This involves a structured progression incorporating only those stages of training found necessary through analysis. A number of simulators are networked in the final stage of training the flight crew, ground controllers, and the mission-related payload user and control personnel. In the development of the Columbus Attached Pressurized Module or the Japanese Experimental Module, software models and hardware mock-ups are linked together so that progressively larger simulations of the system can be performed. Prototype equipment is substituted for the models until the entire system is in place. The need for simulation continues after a mission launch because of the remoteness of support activity from the home base. R.B.

A88-41851

ROLE OF FRACTURE MECHANICS IN MODERN TECHNOLOGY; PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, FUKUOKA, JAPAN, JUNE 2-6, 1986

GEORGE C. SIH, ED. (Lehigh University, Bethlehem, PA), HIRONOBU NISITANI, ED. (Kyushu University, Fukuoka, Japan), and TOMOO ISHIHARA, ED. (Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo, Japan) Conference organized by Kyushu University and Lehigh University. Amsterdam and New York, North-Holland, 1987, 938 p. For individual items see A88-41852 to A88-41881.

Recent advances in fracture mechanics theory, testing methods, and applications are discussed in reviews and reports. Topics addressed include microstructural effects, fatigue, creep and fatigue, environment effects, fracture tests, and dynamic loading. Consideration is given to stress and failure analysis, composite materials, specimen and structural integrity, numerical analysis, and residual stresses. Diagrams, drawings, graphs, micrographs, and tables of numerical data are provided. T.K.

A88-42907#

APPLICATION OF RISK ASSESSMENT TECHNIQUES IN OPTIMIZING FUTURE SPACE MISSIONS

K. J. CHILCOT (McDonnell Douglas Astronautics Co., Huntington

Beach, CA) AIAA, Space Programs and Technologies Conference, Houston, TX, June 21-24, 1988. 15 p. refs
(AIAA PAPER 88-3509)

This paper presents a risk assessment of four future space initiatives: Mission to Planet Earth, Exploration of the Solar System, Outpost on the Moon, and Humans to Mars. This assessment identifies the potential risk issues so as to plan corrective measures, identify those key technologies having the greatest potential for reducing both technical and programmatic risk, and aid in selecting the preferred low-risk mission approach to the initiatives. Risk is defined in terms of the ability to achieve the mission/operational requirements, schedule, or cost goals. The risk assessment approach is based on a set of risk criteria established in this paper. The missions are subdivided into functional components; each component is assessed against the criteria. The result is a list of potential risk areas for each mission. Also assessed are required space transportation and orbital facilities. Some technical risks have been addressed by the NASA Project Pathfinder technology program; however, others identified in this paper require attention. Author

A88-42917#

FAA ROLES AND OUTLOOK FOR SAFETY

JOHN J. SHAPLEY (FAA, Fort Worth, TX) IN: Vertical flight training needs and solutions; Proceedings of the AHS National Specialists' Meeting, Arlington, TX, Sept. 17, 18, 1987. Alexandria, VA, American Helicopter Society, Inc., 1987, p. 35-38.

Rotorcraft certification and research and development conducted by the FAA are discussed. Certification rules and aspects of minimum safety standards and the development of power-lift standards for tilt-rotor aircraft are examined. Accident investigations, pilot workload scenarios, and workload requirements exceeding capabilities of the crew are incorporated into the certification process. Specific workload scenarios are presented, discussing their use in the development of certification requirements. R.B.

A88-43341

MTBF SPECIFICATION IN A MULTIPLE USE ENVIRONMENT

FRANK J. MORENO (Harris Corp., Melbourne, FL) IN: Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 26-28, 1988, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 132-135.

A criterion, in the form of an equivalent failure rate equation, is developed which allows for the mean time before failure (MTBF) specification of a configuration item that is used in different environments and subject to a varying amount of operational stress. The degree of stress is formulated as a function of the output state, time spent in that state, and a corresponding duty cycle. A methodology is formulated which allows for the expression of failure rates that are associated with multiple conditions resulting from a complex operational scenario. The failure rate equations resulting from this scenario are used to generate a specification that is tailored for a multiple-use environment. I.E.

A88-43360

R&M DESIGN INFLUENCE FROM SPREADSHEET ANALYSIS

EUGENE K. MELNICK and KENNETH D. PORAD (Boeing Aerospace Co., Seattle, WA) IN: Annual Reliability and Maintainability Symposium, Los Angeles, CA, Jan. 26-28, 1988, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 336-339.

The authors describe a computer-aided analysis method using commercially available software to provide quick estimates needed to support reliability and maintainability (R&M) decisions during the early stages of a development program. The method is equally applicable to both military and commercial contracts. The method utilizes fragmentary existing data supplemented by flexible estimating factors to expeditiously derive data in spreadsheet format, and is a useful tool for influencing design to include R&M requirements and enhancements. I.E.

A88-44698* National Aeronautics and Space Administration, Washington, DC.

PROPULSION SAFETY ALMOST EQUALS MISSION SAFETY
GILBERT L. ROTH (NASA, Washington, DC) AIAA, ASME, SAE, and ASEE, Joint Propulsion Conference, 24th, Boston, MA, July 11-13, 1988. 5 p. refs
(AIAA PAPER 88-2881)

Propulsion system hardware and monitoring/control software constitute a given manned or unmanned aerospace system's primary risk-management issue. The present inquiry into the reasons for this dominance attempts to identify development routes to the reduction of propulsion-related management risk issues. A 'life management plan' for propulsion systems would give attention to service life requirements, criteria for the monitoring and evaluation of useful life, a method for the tracking of service life, criteria for hardware reusability and operations inspection, and hardware preassembly screening practices. O.C.

A88-46253

THE CERTIFICATION ASPECTS OF MICROWAVE LANDING SYSTEMS - AIRWORTHINESS CONSIDERATIONS

SIMON A. WITTS (Civil Aviation Authority, Design and Manufacturing Standards Div., Redhill, England) IN: MLS - An operational and technical review; Proceedings of the Symposium, London, England, Feb. 9, 1988. London, Royal Aeronautical Society, 1988, p. 16-25.

An outline is presented of the certification requirements that could be applied for an MLS. The importance of a research program such as the joint Boeing/British Airways/Civil Aviation Authority trial is demonstrated. The trial seeks to establish and incorporate certification requirements for straight-in 3-deg MLS approaches. K.K.

A88-48499#

COST-OF-A-CASSETTE AIR SAFETY

MASAYASU KAWAI (Kyowa Dengyo (Europe), Hoofdrorp, Netherlands) Aerospace America (ISSN 0740-722X), vol. 26, Aug. 1988, p. 32-34.

By the end of this century, powerful and compact computers directly integrated with aircraft instruments and programmed to analyze the complex interactions occurring over the entirety of the primary structure will make automated inspection part of routine maintenance; such checkups would then be conducted on site by mechanics, rather than in computer rooms by engineers. A single, properly equipped portable recorder can accept data from up to 224 sources simultaneously, recording them in separate channels of a video cassette for subsequent analysis. Installed recording equipment prompts more frequent monitoring, leading to more dependable and accurate advance warning of system defects, component deterioration, and metal fatigue. O.C.

A88-50789

INTERNATIONAL MODAL ANALYSIS CONFERENCE, 5TH, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON, ENGLAND, APR. 6-9, 1987, PROCEEDINGS. VOLUMES 1 & 2

Conference sponsored by Union College. Bethel, CT, Society for Experimental Mechanics, Inc., 1987, p. Vol. 1, 853 p.; vol. 2, 915 p. For individual items see A88-50790 to A88-50900.

Various papers on modal analysis and testing are presented. The general topics addressed include: experimental case histories, analytical methods, structural dynamics modification, linking analysis and test, processing modal data, modal test methods, seismic topics, modal techniques for rotating machinery, modeling structures, substructuring, and noise/acoustic topics. Also considered are: experimental techniques, vehicular topics, space structures, machinery diagnostics, nonlinear structures, design methods, damping, ship-related topics, transducers and instrumentation topics, finite element analysis, and modal analysis software. C.D.

A88-50831* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.

AIRCRAFT GROUND VIBRATION TESTING AT NASA AMES-DRYDEN FLIGHT RESEARCH FACILITY

MICHAEL W. KEHOE (NASA, Flight Research Center, Edwards, CA) IN: International Modal Analysis Conference, 5th, London, England, Apr. 6-9, 1987, Proceedings. Volume 1. Bethel, CT, Society for Experimental Mechanics, Inc., 1987, p. 728-736. Previously announced in STAR as N87-27655. refs

At the NASA Ames Research Center's Dryden Flight Research Facility at Edwards Air Force Base, California, a variety of ground vibration test techniques has been applied to an assortment of new or modified aerospace research vehicles. This paper presents a summary of these techniques and the experience gained from various applications. The role of ground vibration testing in the qualification of new and modified aircraft for flight is discussed. Data are presented for a wide variety of aircraft and component tests, including comparison of sine-dwell, single-input random, and multiple-input random excitation methods on a JetStar airplane. Author

A88-52355

REAL-TIME FAULT MANAGEMENT FOR LARGE-SCALE SYSTEMS

H. BIGLARI (Boeing Aerospace Co., Huntsville, AL), C. CHENG, and G. VACHTSEVANOS (Georgia Institute of Technology, Atlanta) IN: Space Congress, 25th, Cocoa Beach, FL, Apr. 26-29, 1988, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1988, p. 9-63 to 9-69. refs

A priori knowledge of failure modes of a system is an indispensable information for design of robust decentralized hierarchical control schemes. In particular inclusion of system faults as part of the process under control provides greater flexibility for self diagnosis and maintenance of real-time systems. By assigning discrete states to the process under control, an 'artificial consciousness' can be created within the controller which allows the controller to exercise selective actions for each given discrete state. This concept has been implemented to control the utility systems of the Space Station Laboratory Simulator. Author

A88-54137* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

TOWARD IMPROVED DURABILITY IN ADVANCED AIRCRAFT ENGINE HOT SECTIONS; PROCEEDINGS OF THE THIRTY-THIRD ASME INTERNATIONAL GAS TURBINE AND AEROENGINE CONGRESS AND EXPOSITION, AMSTERDAM, NETHERLANDS, JUNE 5-9, 1988

DANIEL E. SOKOLOWSKI, ED. (NASA, Lewis Research Center, Cleveland, OH) Congress and Exposition sponsored by ASME. New York, American Society of Mechanical Engineers, 1988, 128 p. For individual items see A88-54138 to A88-54146.

The present conference on durability improvement methods for advanced aircraft gas turbine hot-section components discusses NASA's 'HOST' project, advanced high-temperature instrumentation for hot-section research, the development and application of combustor aerothermal models, and the evaluation of a data base and numerical model for turbine heat transfer. Also discussed are structural analysis methods for gas turbine hot section components, fatigue life-prediction modeling for turbine hot section materials, and the service life modeling of thermal barrier coatings for aircraft gas turbine engines. O.C.

A88-54400

ICING TECHNOLOGY BIBLIOGRAPHY

SAE Aerospace Information Report SAE AIR 4015, Nov. 1987, 149 p. refs
(SAE AIR 4015)

A compendium of references from the open literature on icing technology is presented, including both national and foreign sources. The general topics addressed include: meteorology of icing clouds, meteorological instruments, propeller icing, induction system icing, gas turbine engine and inlet icing studies, wing icing, windshield icing, ice adhesion and mechanical properties, heat

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transfer, helicopter climatic tests and icing, and helicopter rotor blade icing. Other general subjects considered are: engine snow ingestion and snow measurements, droplet trajectories and impingement, ice accretion modeling, icing test facilities and icing simulation, aircraft ice formation, runway icing, microwave sensing and ice protection systems, iced airfoil performance, land and sea ice studies, fluid and two-phase flow dynamics, liquid evaporation and ice crystal formation studies, electrical modeling, and radome icing. C.D.

A88-55276

ISTFA 1987 - INTERNATIONAL SYMPOSIUM FOR TESTING AND FAILURE ANALYSIS: ADVANCED MATERIALS; PROCEEDINGS OF THE SYMPOSIUM, LOS ANGELES, CA, NOV. 9-13, 1987

Metals Park, OH, ASM International, 1987, 358 p. For individual items see A88-55277 to A88-55295.

The present conference discusses topics in the failure analysis of metallic materials, metal-matrix composites (MMCs), environmental effects on metallic materials, the failure analysis of polymers and ceramics and of resin-based composites, case histories in metal-failure analysis, failure-mechanisms in resin-based composites, innovations in test methodologies, and failures in weldments. Attention is given to fatigue cracking in Al-Li alloys, flow and fracture in discontinuous MMCs with high ductility, the service failure of a 7049 T73 Al alloy aircraft forging, the fracture behavior of electronic ceramics, microscopy of composite delamination, a helicopter crew-seat failure analysis, cracking in marine composites, quantitative fractography, and the significance of repair welds in service failures. O.C.

A88-55435*# National Aeronautics and Space Administration, Washington, DC.

NASA'S POST-CHALLENGER SAFETY PROGRAM - THEMES AND THRUSTS

G. A. RODNEY (NASA, Washington, DC) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 7 p.
(IAF PAPER 88-510)

The range of managerial, technical, and procedural initiatives implemented by NASA's post-Challenger safety program is reviewed. The recommendations made by the Rogers Commission, the NASA post-Challenger review of Shuttle design, the Congressional investigation of the accident, the National Research Council, the Aerospace Safety Advisory Panel, and NASA internal advisory panels and studies are summarized. NASA safety initiatives regarding improved organizational accountability for safety, upgraded analytical techniques and methodologies for risk assessment and management, procedural initiatives in problem reporting and corrective-action tracking, ground processing, maintenance documentation, and improved technologies are discussed. Safety issues relevant to the planned Space Station are examined. C.D.

N88-10128# National Bureau of Standards, Gaithersburg, MD. Office of Standard Reference Data.

STANDARD REFERENCE DATA PUBLICATIONS, 1985-1986

J. C. SAUERWEIN Jun. 1987 43 p
(PB87-210241; NBS/SP-708-SUPPL-1) Avail: SOD HC \$2.00 as 003-0003-02802-9; NTIS MF A01 CSCL 07D

The National Bureau of Standards, Office of Standard Reference Data manages a network of data centers that prepare evaluated databases of physical and chemical properties of substances. Databases are available in printed form, on magnetic tapes, diskettes, and through on-line computer networks. The document provides a comprehensive list of the products available from the National Standard Reference Data System (NSRDS) for the years 1985 to 1986, including indexes qualified by author, material, and property terms. Ordering information and current prices can be found at the end of the document. GRA

N88-10586# National Bureau of Standards, Gaithersburg, MD. Office of Physical Measurement Services.

NBS (NATIONAL BUREAU OF STANDARDS) CALIBRATION SERVICES USERS GUIDE: FEE SCHEDULE

Apr. 1987 78 p
(PB87-210654; NBS/SP-250/A) Avail: NTIS HC A05/MF A01 CSCL 20C

The physical measurement services of the National Bureau of Standards are designed to help the makers and users of precision instruments achieve the highest possible levels of measurement quality and productivity. The hundreds of individual services found listed in the Fee Schedule constitute the highest-order calibration services available in the United States. These services directly link a customer's precision equipment or transfer standards to national measurement standards. These services are offered to public and private organizations and individuals alike. The Fee Schedule is a supplement to NBS Special Publication 250, Calibration Services Users Guide. These documents are designed to make the task of selecting and ordering an appropriate calibration service as quick and easy as possible. GRA

N88-15604*# Alabama Univ., Huntsville. Dept. of Industrial Engineering.

RISK ANALYSIS METHODOLOGY SURVEY

ROBERT G. BATSON /n NASA, Marshall Space Flight Center, Research Reports: 1987 NASA/ASEE Summer Faculty Fellowship Program 16 p Nov. 1987
Avail: NTIS HC A99/MF E03 CSCL 12A

NASA regulations require that formal risk analysis be performed on a program at each of several milestones as it moves toward full-scale development. Program risk analysis is discussed as a systems analysis approach, an iterative process (identification, assessment, management), and a collection of techniques. These techniques, which range from simple to complex network-based simulation were surveyed. A Program Risk Analysis Handbook was prepared in order to provide both analyst and manager with a guide for selection of the most appropriate technique. Author

N88-15826# Hernandez Engineering G.m.b.H., Bonn (Germany, F.R.).

SAFETY PHILOSOPHY, POLICY, AND REQUIREMENTS FOR MANNED SPACEFLIGHT. VOLUME 1: EXECUTIVE SUMMARY

JAMES WIGGINS Paris, France ESA 4 Mar. 1987 11 p
(Contract ESTEC-6734/86-NL-MA(SC))
(HEG-0886/1036-VOL-1; ESA-CR(P)-2493-VOL-1; ETN-88-91426)
Avail: NTIS HC A03/MF A01

A philosophy and policy for manned space flight and upper level system requirements which would help program managers and system designers include safety considerations in all phases of the program life cycle were designed. The philosophy emphasizes the importance of human life in the space system. ESA

N88-18290# Carnegie-Mellon Univ., Pittsburgh, PA. Software Engineering Inst.

A METHOD FOR ASSESSING THE SOFTWARE ENGINEERING CAPABILITY OF CONTRACTORS: PRELIMINARY VERSION Final Report

W. S. HUMPHREY and W. L. SWEET Sep. 1987 46 p
(Contract F19628-85-C-0003)
(AD-A187230; CMU/SEI-87-TR-23; ESD-TR-87-186) Avail: NTIS HC A03/MF A01 CSCL 12E

This document provides guidelines and procedures for assessing the ability of potential DOD contractors to develop software in accordance with modern software engineering methods. It includes specific questions and a method for evaluating the results. GRA

N88-18518# National Bureau of Standards, Gaithersburg, MD.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 92, NUMBER 5, SEPTEMBER-OCTOBER 1987

10 LEGALITY, LEGISLATION, AND POLICY

1987 58 p
(PB88-124409) Avail: NTIS HC A04/MF A01 CSCL 05A

Articles in the Journal of Research of NBS include the following:
An automated potentiometric system for precision measurement of the quantized hall resistance; the NBS large-area alpha-particle counting system; Mossbauer imaging; International intercomparisons of photometric base units. GRA

N88-18519# National Bureau of Standards, Gaithersburg, MD.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 92, NUMBER 6, NOVEMBER-DECEMBER 1987

1987 54 p
(PB88-138516) Avail: NTIS HC A04/MF A01; also available SOD HC \$3.00 as 703-027-00019-9 CSCL 05A

This issue of the NBS Journal of Research contains the following: reports on Standard Reference data information; international standards for nondestructive testing; superconductivity - challenge for the future; transient impact response of thick circular plates; transient impact response of plates containing flaws; and a low noise cascade amplifier. GRA

N88-20353*# Wyle Labs., Inc., Huntsville, AL.
SPACECRAFT FIRE-SAFETY EXPERIMENTS FOR SPACE STATION: TECHNOLOGY DEVELOPMENT MISSION Final Contractor Report

WALLACE W. YOUNGBLOOD Apr. 1988 111 p
(Contract NAS3-25067)
(NASA-CR-182114; NAS 1.26:182114; WYLE-68300-1) Avail: NTIS HC A06/MF A01 CSCL 22B

Three concept designs for low-gravity, fire-safety related experiments are presented, as selected for the purpose of addressing key issues of enhancing safety and yet encouraging access to long-duration, manned spacecraft such as the NASA space station. The selected low-gravity experiments are the following: (1) an investigation of the flame-spread rate and combustion-product evolution of the burning of typical thicknesses of spacecraft materials in very low-speed flows; (2) an evaluation of the interaction of fires and candidate extinguishers in various fire scenarios; and (3) an investigation of the persistence and propagation of smoldering and deep-seated combustion. Each experiment is expected to provide fundamental combustion-science data, as well as the fire-safety applications, and each requires the unique long-duration, low-gravity environment of the space station. Two generic test facilities, i.e., the Combustion Tunnel Facility and the Combustion Facility, are proposed for space station accommodation to support the selected experiments. In addition, three near-term, fire-safety related experiments are described along with other related precursor activities. Author

N88-24234# Federal Aviation Administration, Washington, DC.
ADVISORY CIRCULAR: NOISE CERTIFICATION HANDBOOK
23 Mar. 1988 66 p
(FAA-AC-36-4B) Avail: NTIS HC A04/MF A01

The aim of this technical manual is to promote uniformity of implementation of the noise certification requirement of Part 36 of the Federal Aviation Regulations (FAR) by presenting test, analysis, and documentation procedures for subsonic turbojet airplanes that were determined by the FAA to be technically acceptable for demonstrating compliance with that regulation. Where appropriate, FAA policy governing such certifications is reviewed. Author

N88-24977# Oak Ridge Gaseous Diffusion Plant, TN.
A QUALITY PHILOSOPHY FOR RESEARCH AND DEVELOPMENT

G. J. KIDD, JR. Feb. 1988 17 p
(Contract DE-AC05-84OT-21400)
(DE88-006512; K/QT-178) Avail: NTIS HC A03/MF A01

The application of traditional quality assurance techniques to research and development (R and D) has not been successful. This report presents some of the features that distinguish R and D from other industrial enterprises and suggests an approach for adapting existing standards to R and D. DOE

N88-24983*# United Technologies Corp., East Hartford, CT.
QUALITY AND PRODUCTIVITY DRIVE INNOVATION AND IMPROVEMENT AT UNITED TECHNOLOGIES AEROSPACE OPERATIONS, INC.

L. G. JAMAR 24 Nov. 1986 19 p Submitted for publication
(Contract NAS8-36300)
(NASA-CR-182944; NAS 1.26:182944) Avail: NTIS HC A03/MF A01 CSCL 14D

Quality and innovation are the hallmarks of the national space program. In programs that preceded the Shuttle Program the emphasis was on meeting the risks and technical challenges of space with safety, quality, reliability, and success. At United Technologies Aerospace Operations, Inc. (UTAO), the battle has developed along four primary fronts. These fronts include programs to motivate and reward people, development and construction of optimized processes and facilities, implementation of specifically tailored management systems, and the application of appropriate measurement and control systems. Each of these initiatives is described. However, to put this quality and productivity program in perspective, UTAO and its role in the Shuttle Program are described first. B.G.

N88-29263# Centers for Disease Control, Atlanta, GA.
QUALITY CONTROL IN MICROBIOLOGY: CDC LAB MANUAL
J. M. MILLER Nov. 1987 106 p
(PB88-179890) Avail: NTIS HC A06/MF A01 CSCL 06C

A brief historical background is given for procedural technology in the laboratory. The topic headings are: Quality control in the microbiology laboratory; Introduction; Establishing a quality control policy; Laboratory safety; Equipment; Media, Reagents, Disks, Strips; Products for direct antigen detection; Documentation; Antisera disk/strips, Reagents-Aerobic bacteriology; Quality control frequency guidelines for antimicrobial susceptibility testing; Media-anaerobic bacteriology; Mycobacteriology. Author

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LEGALITY, LEGISLATION, AND POLICY

Includes Laws and Legality, Insurance and Liability, Patents and Licensing, Legislation and Government, Regulation, Appropriations and Federal Budgets, Local, National, and International Policy.

A88-10367#
SPACE STATION CAREENS PAST ALL OBSTACLES
JERRY GREY Aerospace America (ISSN 0740-722X), vol. 25, Sept. 1987, p. 24-28.

The difficulties involved in planning the development of the Space Station, in particular federal policies and financing, are described. Concerns about the design and operating characteristics of the Space Station and the support of the Station are examined. The roles of foreign participants (ESA, Japan, Canada) and the U.S. DOD in the development and use of the Space Station are discussed. It is strongly emphasized that a firm national commitment to a unified Space Station policy is needed, and that a Space Station is the key element in virtually every scenario that has been proposed for the U.S. future in space. I.F.

A88-13443
THE COMMERCIAL USE OF SPACE STATIONS: THE LEGAL FRAMEWORK OF TRANS-ATLANTIC COOPERATION; INTERNATIONAL COLLOQUIUM, HANOVER, FEDERAL REPUBLIC OF GERMANY, JUNE 12, 13, 1986, REPORTS [WIRTSCHAFTLICHE NUTZUNG VON WELTRAUMSTATIONEN: DER RECHTLICHE RAHMEN TRANSATLANTISCHER ZUSAMMENARBEIT; INTERNATIONALES KOLLOQUIUM, HANOVER, FEDERAL REPUBLIC OF GERMANY, JUNE 12, 13, 1986, BEITRAEGE]
Colloquium supported by BMFT; Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, 227 p. In German and English. For

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individual items see A88-13444 to A88-13453.
(Contract BMFT-SLN-86023)
(DGLR BERICHT 86-02)

Papers are presented on the commercial use of space stations; current government-to-government negotiations on the Space Station; an applicable legal regime for international cooperation on space stations; and a legal basis for activities on space stations. Consideration is given to legal problems related to the construction of the Space Stations; national jurisdiction on the Space Station; U.S. legislation governing technology transfer; and a legal regime for technology transfer. Business issues related to materials processing in space and proprietary rights are discussed. I.F.

A88-13445# NEGOTIATING THE SPACE STATION

MICHAEL A. G. MICHAUD (U.S. Department of State, Washington, DC) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 29-36.

The diplomacy of negotiating international cooperation for a permanently manned Space Station is considered from an American perspective. The negotiations are to be conducted with Europe, Japan, and Canada on two levels: (1) an agency-agency memorandum of understanding and (2) a government-to-government agreement. The principles for the conduct of the negotiations are discussed. The rights, authority, and roles of the partners, and the issue of technology transfer are examined. I.F.

A88-13446# THE APPLICABLE LEGAL REGIME FOR INTERNATIONAL COOPERATION ON SPACE STATIONS

STEPHEN GOROVE (Mississippi, University, University) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 37-61. refs

The creation of a useful legal regime governing international cooperation on space stations is examined. The basic characteristics and functions of the proposed NASA earth-orbiting Space Station are described. The bilateral agreements between the U.S. and Canada, Japan, and ESA for the proposed design and development of the Space Station, in particular the U.S.-ESA Memorandum of Understanding, are discussed. The need for government-to-government agreements to handle issues such as jurisdiction, control, and registration of the Space Station; proprietary rights; and technology transfer is studied. Consideration is given to the relevance of domestic law and general international regulations; telecommunication issues; the transportation of hazardous materials; and the use of nuclear power. I.F.

A88-13447# A LEGAL FRAMEWORK FOR SPACE STATION ACTIVITIES

TADAO KURIBAYASHI (Keio University, Tokyo, Japan) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 63-71.

The development of laws governing Space Station activities is studied. The agreement between NASA and Japan regarding the design and development of the Japanese Experimental Module is examined. Current and proposed laws applicable to the registration, jurisdiction, and control of the Space Station, and the nature and purposes of specific space activities are discussed. It is suggested that disciplinary regulations and safety standards be uniform for all countries participating in the Space Station and experiments, manufacturing, research, and observations be conducted jointly or separately. Consideration is given to proprietary rights, liability for damages, tort laws, and the preservation of the space environment. I.F.

A88-13448# THE APPLICABLE LEGAL REGIME FOR INTERNATIONAL COOPERATION

I. H. PH. DIEDERIKS-VERSCHOOR (International Institute of Space Law, Paris, France) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 73-85. refs

The applicability of international agreements and United Nations space treaties to space stations operated cooperatively by more than one nation is examined, reviewing several recent proposals and opinions. Topics addressed include the interpretation of Article XII of the Space Treaty of 1967; the composition, duties, and rights of a space station management board; the Liability Convention of 1972; the Convention on Registration of Objects of 1976; and the legal questions posed by multicomponent space stations. T.K.

A88-13450# NATIONAL JURISDICTION ON THE SPACE STATION

RICHARD DALBELLO (U.S. Congress, Office of Technology Assessment, Washington, DC) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 119-139. refs

Legal questions regarding jurisdiction aboard the International Space Station are discussed from a U.S. perspective. Topics examined include (1) national jurisdiction over the Space Station and/or its components, (2) jurisdiction of courts over specific cases or controversies, (3) choice-of-law questions resulting from the adjudication of Space Station disputes, and (4) the sharing of jurisdiction between the U.S. federal government and the states. It is suggested that international lawyers have some relevant experience regarding areas (2) and (3), but that some rules should probably be developed beforehand due to the highly visible and political nature of international space ventures. Resolution of the primarily political and technological conflicts foreseen in area (1) by mechanisms similar to NATO Status of Forces Agreements is recommended, and the need for Congressional limits on state legislation to prevent problems in area (4) is indicated. T.K.

A88-13452# LEGAL PROBLEMS OF THE COMMERCIAL USE OF SPACE STATIONS INCLUDING PROPRIETARY RIGHTS

CLAUDIO ZANGHI (Ministero di Ricerca Scientifica e Tecnologica, Rome, Italy) and LUIGI CITARELLA (Roma, Universita, Rome, Italy) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 181-200.

Potential legal questions arising from commercial activities aboard an international space station are examined in a general review. The lack of clearly defined regulations governing stations made up of component modules belonging to different nations is stressed, and it is argued that simple application of national jurisdictions over activities on each module is unrealistic. A system of international regulations based on pragmatic (cost) factors is recommended, and possible provisions of such an agreement are discussed. T.K.

A88-13453*# National Aeronautics and Space Administration, Washington, DC.

PROPRIETARY RIGHTS AND COMMERCIAL USE OF SPACE STATIONS

ROBERT F. KEMPF (NASA, Washington, DC) IN: The commercial use of space stations: The legal framework of trans-Atlantic cooperation; International Colloquium, Hanover, Federal Republic of Germany, June 12, 13, 1986, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1986, p. 201-216.

The treatment of proprietary rights related to commercial activity

aboard an international space station is discussed, with a focus on the relationship between the acquisition (on earth or in space) and protection of such rights. The applicable national and international law is briefly characterized, and consideration is given to patent, trade-secret, and copyright considerations. It is concluded that the provisions of present commercial law can be applied relatively straightforwardly to rights acquired on earth, while the Outer Space Treaty of 1967 and the Convention on Registration of 1976 apply to rights obtained in space. T.K.

A88-15304* National Aeronautics and Space Administration, Washington, DC.

INSURANCE AND INDEMNIFICATION IMPLICATIONS OF FUTURE SPACE PROJECTS

JOHN E. O'BRIEN (NASA, Washington, DC) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 7 p.

NASA options regarding insurance and indemnification policies as they relate to NASA customers and contractors are described. The foundation for the discussion is the way in which NASA is planning to return the Space Shuttle fleet to safe flight as well as current U.S. policy concerning future uses of the Shuttle fleet. Issues discussed include: the nature of the Shuttle manifest; the policy regarding property damage or destruction; insurance against liability to third parties; the reduction of the scope of the risk to be insured; NASA as the insurer; a sharing arrangement between the user and NASA; and contractors and subcontractors involved in Shuttle operations. B.J.

A88-15305

CONTRACTUAL METHODS OF INCENTIVIZING IMPROVED SPACE FLIGHT SAFETY

JAMES R. VICKERS (Hughes Aircraft Co., Missile Systems Group, Canoga Park, CA) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 7 p.

The contractual methods NASA uses to assure safety for manned space flights are examined in this paper. It concludes that they do little to incentivize a contractor to improve safety and suggests that in areas as critical as manned space flight safety, NASA adopt a Safety Engineering Incentive Program. This program would be similar to the existing Value Engineering program except that financial incentives would be paid for improving safety. The paper also suggests that as an added incentive for improving safety, relief from liability under Public Law 85-804 on future projects be conditioned by limiting it to risks that the contractor disclosed to NASA or risks that he could not have known. Author

A88-15306* National Aeronautics and Space Administration, Washington, DC.

DEBARMENT AND SUSPENSION

THOMAS J. WHELAN (NASA, Procurement Policy Div., Washington, DC) IN: Space Congress, 24th, Cocoa Beach, FL, Apr. 21-24, 1987, Proceedings. Cape Canaveral, FL, Canaveral Council of Technical Societies, 1987, 7 p.

The changing Government attitude toward contractor debarment and suspension is examined, with emphasis on the fact that the Government is more alert to fraud, waste, and abuse. Consideration is given to causes of debarment or suspension, procedures and due process hearings, settlement agreements, compliance programs, and recent related legislation. It is concluded that the change in the Government contracting environment in recent years should be sufficient incentive for contractors to monitor their operations more closely. B.J.

A88-16193#

A CRITICAL EXAMINATION OF FACTORS THAT MIGHT ENCOURAGE SECRECY

ALLEN TOUGH (Toronto, University, Canada) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987, 7 p. refs (IAF PAPER 87-586)

Seven factors that may encourage a government to keep secret a signal from extraterrestrial intelligence are critically examined. These factors are: (1) belief that people may panic; (2) fear of a negative impact on religion, science, and culture; (3) embarrassment; (4) individual and national competitive urges; (5) avoiding a harmful premature reply; (6) a national trade or military advantage; and (7) fear of a Trojan horse. Steps that can be taken to alleviate the most significant of these factors are considered. C.D.

A88-16245#

CHANGING PATTERNS OF INTERNATIONAL COOPERATION IN SPACE - THE SOVIET FACTOR

J. JOHNSON-FREESE (Central Florida, University, Orlando, FL) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987, 37 p. refs (IAF PAPER 87-672)

Changes in the Soviet position regarding cooperation on international space ventures, why the changes have occurred, and the possible consequences of these changes are discussed. Until recently, Soviet cooperation has been limited to exchanges with Eastern bloc countries. It is suggested that, in the past few years, the Soviet Union has placed more emphasis on the nonmilitary aspects of space and has increased its desire to work with Western countries on space science projects. Furthermore, the Glavkosmos organization now offers several types of commercial space services, including the launching of satellite payloads (primarily with the Proton booster), vertical sounding rockets, and the sale of Soviet-collected earth resource data. R.R.

A88-16247#

THE INTERNATIONAL POLITICAL ECONOMY OF SPACE ACTIVITIES

JOHN M. LOGSDON (George Washington University, Washington, DC) IAF, International Astronautical Congress, 38th, Brighton, England, Oct. 10-17, 1987, 5 p. refs (IAF PAPER 87-674)

The current space scene internationally can be characterized in terms of a number of patterns or trends. It is the totality of these elements, and the interactions among them, that can be described as the international political economy of space. While competition for political leadership and economic payoffs will continue to be a strong influence on the space activities of major countries, that competition will increasingly take place within a framework of multilateral structures and cooperative undertakings. In addition, the continued and even increasing primacy of military space activities in most countries will present a constraint on the government resources available for civilian space programs. Author

A88-18225

SOVIET SPACEFLIGHT OFFERS - WILL THE U.S. BLOCK THE 'CAPITALIST ROAD'?

CHRIS BULLOCH Space Markets (ISSN 0258-4212), Fall 1987, 1987, p. 142-145.

The recent change in Soviet policy concerning commercial space-flight offers to other countries is examined. Particular consideration is given to Soviet involvement in Inmarsat, the role of Glavkosmos, insurance issues, launcher offers, experiments on Soviet platforms, and conditions of carriage. B.J.

A88-18584

OUTER SPACE: POLITICS AND LAW

V. S. VERESHCHETIN, ED., E. VASILEVSKAIA, ED., and E. KAMENETSKAIA, ED. Moscow, Progress Publishers, 1987, 134 p. Translation. refs

Legal and political aspects of space activity are discussed, with a focus on the international regulation of military activities. Chapters are devoted to barring weapons from outer space, problems in the development of international space law, international cooperation in the exploration and use of outer space, and the legal consequences of the privatization of space activity. T.K.

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A88-22719

RECENT DEVELOPMENTS IN AVIATION CASE LAW

MICHAEL J. SEHR (Haskell and Perrin, Chicago, IL) *Journal of Air Law and Commerce* (ISSN 0021-8642), vol. 53, Fall 1987, p. 85-188. refs

In the present article, the concept of 'aviation case law' encompasses those areas of the law which most directly affect the concerns of attorneys practicing in the area of aviation tort law. The case law arising under the Foreign Sovereign Immunities Act is given particular attention since it may be significant to aviation practitioners. Recent developments are essentially those occurring during November 1, 1985 to February 15, 1987. A number of specific cases are discussed. K.K.

A88-25829

THE ENLARGEMENT OF THE EUROPEAN SPACE AGENCY - LEGAL ISSUES

G. LAFFERRANDERIE *Journal of Space Law*, vol. 15, no. 2, 1987, p. 119-130. refs

Various ways of expanding the ESA are examined. The levels of involvement in ESA's activities are as: (1) a member state, (2) an associate member, or (3) a state participating in programs. The procedures for admission to the agency are discussed, and the acceptance procedures for Austria and Norway are presented as examples of the admission policy. The status and rights of associate members are described. Associate membership is offered in two forms, as a preliminary step prior to full membership or as a form of cooperation; the implementation of the concept of associate membership is explained using the case of Ireland. The participation in ESA as a state involved in its science or optional programs is considered, and an example is provided. I.F.

A88-25830

PROTECTING SPACE ASSETS - A LEGAL ANALYSIS OF 'KEEP-OUT ZONES'

F. KENNETH SCHWETJE (USAF, Washington, DC) *Journal of Space Law*, vol. 15, no. 2, 1987, p. 131-146. refs

Legal arguments and policies concerned with the establishment of safety zones (keep-out zones) around space objects are studied. The technical concept of keep-out zones is described. International laws and treaties which deal with safety zones in areas on earth are examined, and examples are provided. Soviet and U.S. views on the implementation of keep-out zones are discussed. Problems with implementing these zones, such as safety, security, and traffic management, are considered. It is argued that there are already international (land) laws that relate to safety zones and that based on these laws the implementation of space keep-out zones would be legally possible if it were necessary. I.F.

A88-25831

SPACE COMMUNICATIONS TO AIRCRAFT - A NEW DEVELOPMENT IN INTERNATIONAL SPACE LAW. II

WOLF D. VON NOORDEN *Journal of Space Law*, vol. 15, no. 2, 1987, p. 147-160. refs

The use of Inmarsat satellites for maritime and aeronautical mobile communications is examined from a legal perspective. The proposed amendments to the Inmarsat Convention and Operating Agreement as regards aeronautical satellite telecommunications are discussed, and the amendments process is described. The relationship between Inmarsat and ICAO is analyzed. Consideration is given to the research of ICAO's committee on Future Air Navigation Systems and the WARC's establishment of frequency requirements for mobile satellite services. I.F.

A88-26148

INTERNATIONAL LEGAL PROTECTION OF THE OUTER SPACE ENVIRONMENT AGAINST HARMFUL CONTAMINATION - PRELIMINARY REMARKS

ANDRZEJ GORBIEL (Lodz, Uniwersytet, Poland) *Postępy Astronautyki* (ISSN 0373-5982), vol. 20, no. 1-2, 1987, p. 109-128. refs

Issues associated with space debris are addressed. The need for an international multilateral legal instrument containing detailed

guiding principles and rules which would ensure protection of the outer space environment is demonstrated. The author suggests that the United Nations Outer Space Legal SubCommittee is best suited to provide this instrument. K.K.

A88-26197

COLLOQUIUM ON THE LAW OF OUTER SPACE, 28TH, STOCKHOLM, SWEDEN, OCT. 7-12, 1985, PROCEEDINGS

Colloquium sponsored by IAF. New York, American Institute of Aeronautics and Astronautics, 1986, 317 p. No individual items are abstracted in this volume.

The legal implications of recent advances in space technology and exploitation are explored in reviews and reports. The emphasis is on efforts to limit military activities in space, but consideration is also given to comparisons of sea law and space law governing exploration and exploitation, the legal problems of registering space objects, and particular space activities as the subjects of space law. Topics addressed include nuclear winter, ballistic missile defense, and the legal regime for outer space; space law and space offensive weapons; an interdisciplinary approach to the SDI debate; the effect of fiber-optic communication on space radio regulations; the registration treaty and nuclear power sources; protecting the security of space traffic; the problem of orbital debris; plans for the International Space Station; and technicolegal and medicolegal aspects of manned space stations. T.K.

A88-28539

A FORWARD LOOKING SPACE POLICY FOR THE USA

HANS MARK (Texas, University, Austin, TX) *Space Policy* (ISSN 0265-9646), vol. 4, Feb. 1988, p. 19-23.

The assumptions of the 1958 Space Act are reexamined with emphasis placed on ways in which they could be modified to incorporate technical and political developments since 1958. The question of whether or not the U.S. should continue to run separate civilian and military space programs is considered and the major goals of the U.S. space exploration program are outlined. The development and operation of launch vehicles is discussed in detail and ways in which the commercial sector could be drawn into the launch vehicle business are presented. K.K.

A88-28540

INTERNATIONAL RELATIONS IN SPACE - A US VIEW

HERMAN POLLACK (George Washington University, Washington, DC) *Space Policy* (ISSN 0265-9646), vol. 4, Feb. 1988, p. 24-30.

A Task Force of the NASA Advisory Council was recently asked to assess whether the changing global context for space activities required any adjustments in NASA's approach to its international activities. This article presents the Task Force's major findings and conclusions. The U.S.A. must reinvigorate its civil space program, with responsibility clearly assigned, and long-term goals and directions established. Through cooperation, it must bring other nations to share those goals and move in the same directions. Author

A88-28543

SECURITY IMPLICATIONS OF REMOTE SENSING

BHUPENDRA JASANI (Royal United Services Institute, London, England) and CHRISTER LARSSON (Space Media Network, Stockholm, Sweden) *Space Policy* (ISSN 0265-9646), vol. 4, Feb. 1988, p. 46-59. refs

Major technical advances in remote sensing have developed sophisticated systems with both extensive military and civilian applications. Not only the U.S.A. and USSR, but a growing number of other countries such as China, France, India and Japan are actively engaged in remote-sensing R&D. This article reviews the capabilities of civilian satellite technologies and programs of various nations, and examines the implications for national and international security. Many states are concerned about the commercial availability of data on their economic resources and national security-related activities. A particular problem is the possible misinterpretation of remotely-sensed data. Author

A88-29199* National Aeronautics and Space Administration, Washington, DC.

INTERNATIONAL COOPERATION IN PLANETARY EXPLORATION - PAST SUCCESS AND FUTURE PROSPECTS
JEFFREY D. ROSENDHAL (NASA, Office of Space Science and Applications, Washington, DC) (COSPAR, IAU, IUGS, et al., Plenary Meeting, 26th, Topical Meeting C3, Workshop III, and Symposium 8 on Planetary Studies, Toulouse, France, June 30-July 11, 1986) *Advances in Space Research* (ISSN 0273-1177), vol. 7, no. 12, 1987, p. 213-218.

A review is given of the ways in which the National Aeronautics and Space Administration (NASA) has participated in international efforts to explore the solar system. Past examples of successful international cooperative programs are described. Prospects for future cooperative efforts are discussed with emphasis placed on current events, issues, and trends which are likely to affect possibilities for cooperation over the next 5 to 10 years. Key factors which will play a major role in shaping future prospects for cooperation include the move towards balancing the budget in the United States and the impact of the Challenger accident on the NASA program. Author

A88-29201
INTERNATIONAL COOPERATION IN SPACE WITHIN ESA
R. M. BONNET (ESA, Paris, France) (COSPAR, IAU, IUGS, et al., Plenary Meeting, 26th, Topical Meeting C3, Workshop III, and Symposium 8 on Planetary Studies, Toulouse, France, June 30-July 11, 1986) *Advances in Space Research* (ISSN 0273-1177), vol. 7, no. 12, 1987, p. 227-231.

The various areas and missions involving international cooperation and coordination with ESA and its various space partners are reviewed. Special mention is made of cooperation with NASA which has been a privileged partner of ESA for many years. The past and future activities conducted within the Inter Agency Consultative Group (IACG) are also mentioned. It is shown that the apparent loss of independence which may result from extensive international cooperation can be corrected through the existence of a Long Term Plan. Author

A88-29772#
A FRESH LOOK AT LAUNCH-SERVICE CONTRACTS
W. THOMA (ESA, Directorate of Administration, Paris, France) *ESA Bulletin* (ISSN 0376-4265), no. 53, Feb. 1988, p. 49, 50.

An important consequence of the Space Shuttle Challenger accident was the change in U.S. government policy concerning nongovernmental and commercial launchings. Customers are increasingly interested not only in launch services' availability, but also the flexibility offered in terms of launch date changes, relaunches, overall price, and reliability. This situation is rendered more complex by the very high insurance premiums and only-partial insurance coverage currently available. Attention is given to the application of a 'best efforts' philosophy to contractual provisions in the event of launch date changes. O.C.

A88-29776#
INSURANCE OF SPACE RISKS
L. PLOECHINGER (Deutscher Luftpool, Munich, Federal Republic of Germany) *ESA Bulletin* (ISSN 0376-4265), no. 53, Feb. 1988, p. 84-87.

An evaluation is made of the lengths to which the insurance market is prepared to go in order to insure the inherent risks of spacecraft missions; coverage is as a rule extended to commercial aircraft, and insurance protection remains unobtainable for manned spacecraft scientific experiments and for research satellites, since their degree of risk is considered incalculable. Past experience has led to a massive increase in premiums, especially for launch insurance; a premium of up to 25 percent of the insured sum must currently be assumed. O.C.

A88-30700
NEW ASPECTS OF NATIONAL AVIATION POLICIES AND THE FUTURE OF INTERNATIONAL AIR TRANSPORT REGULATION

H. A. WASSENBERGH *Air Law* (ISSN 0165-2079), vol. 13, Feb. 1988, p. 18-34. refs

It is suggested that States should promote a 'globalization' of air transport policies, beginning, if need be, on a plurilateral or regional level. In effect, the EEC may set an example by nationalizing and privatizing the airline industry. Regarding aviation relations with non-EEC countries, the EEC must find a compromise for this 'free competition' objective. In addition, the EEC and its European Commission should permit the formation of European megacarriers provided that competition is not eliminated from the intra-EEC air traffic market. K.K.

A88-31000
THE NATIONAL AEROSPACE PLANE: A POLITICAL OVERVIEW
KARL T. KAHRE (California Polytechnic State University, San Luis Obispo) *Warrendale, PA, Society of Automotive Engineers, 1986, 8 p. refs* (SAE PAPER 872529)

The NASA-DOD National Aerospace Plane (NASP) will entail \$3.3 billion in funding through the mid-1990s toward, among other development costs, the subcontracts that have been awarded to five airframe- and two propulsion-related firms. At the conclusion of the third phase of this program, the X-30 experimental aircraft for intensive hypersonic flight research will be produced. Legislative history, technical development status, and applications-spinoff evaluations are presented for the NASP program. O.C.

A88-33435
GOVERNMENT POLICIES ON SPACE COMMERCIALIZATION - INDUSTRY WAITS AT THE ALTAR
PETER M. STARK (Center for Innovative Technology, Herndon, VA) IN: *EASCON '87; Proceedings of the Twentieth Annual Electronics and Aerospace Systems Conference, Washington, DC, Oct. 14-16, 1987. New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 89-91.*

U.S. government policies relating to the commercial use of space have been established by both the White House and NASA. Both policies make strong statements about what the government is willing to do in order to support and attract private sector investment in space businesses. While the government has initiated several actions which encourage private sector investment in space, a comparison of the government's policies with the actions that have been taken to implement them reveals a significant gap still remaining. These unfulfilled policy statements represent perhaps the largest remaining obstacle to significant commercial space activity. Author

A88-35076
CONGRESSIONAL VIEWS ON COMMERCIAL SPACE
LILLIAN M. TRIPPETT (U.S. House of Representatives, Washington, DC) IN: *Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 447-451.* (AAS PAPER 86-454)

For commercial space, the 99th Congress was a period of learning, some disappointments and setbacks and yet, despite them, some progress on the policy front. The Committee on Science and Technology made headway in understanding the optimum level of government involvement in space commercialization and an appropriate government role in stimulating private investment in space activities. Congressional efforts to ensure the availability of low cost, reliable access to space for commercial and foreign users intensified following the Challenger accident, when it was learned that the U.S. could not rely solely on the Space Shuttle for access to space. Congressional efforts to ensure the development of a domestic expendable launch vehicle industry will be discussed. The placement of a permanently manned Space Station in orbit will further extend commercial opportunities in space. How U.S. laws and regulations apply to the Space Station will significantly affect the character of private sector interest and participation in the Space Station. Congressional action to extend

10 LEGALITY, LEGISLATION, AND POLICY

patent and other laws to U.S. activities conducted in space will be described. Finally, prospects for the 100th Congress will be explored.

Author

A88-35077

COMPETITION AND COOPERATION IN INTERNATIONAL JOINT PROJECTS

BRENDA FORMAN (Lockheed Corp., Calabasas, CA) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 455-462.

(AAS PAPER 86-342)

An analysis is undertaken of the tension between cooperation and competition in joint endeavors, beginning with the company-to-company teaming arrangement, through large-scale R&D consortia formed under the National Cooperative Research Act of 1984, to major international undertakings such as the U.S. Space Station. Examples are discussed of various techniques used to protect proprietary information while furthering the goals of the joint undertaking.

Author

A88-35082* National Aeronautics and Space Administration, Washington, DC.

SPACE LAW AND ITS APPLICATIONS FOR THE FUTURE

HELEN S. KUPPERMAN (NASA, Office of General Law, Washington, DC) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 489-493.

(AAS PAPER 86-362)

The paper outlines space law as it currently stands and sets forth the arena in which such law has been negotiated. Note is taken of the flexibility set forth in these negotiated treaties and the fact that the treaties provide the necessary framework for the development of cooperative space activities in the future.

Author

A88-35083

SOME RECENT DEVELOPMENTS IN UNITED STATES COMMERCIAL SPACE POLICY AND LAW

JOHN B. GANTT (Hunton and Williams, Washington, DC) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 495-505.

(AAS PAPER 86-363)

The author examines several recent U.S. legal and policy developments that reflect a growing interest of Congress and the Executive Branch (and even the Supreme Court) as to space commercialization matters. These developments evidence a determination by Congress and the President to overhaul previous policy with respect to access to space. Even so, the author believes a greater bi-partisan effort is required to shape a U.S. civilian space policy and legal environment conducive to long-term space commercialization investment decisions.

Author

A88-35088

NATIONAL SPACE POLICY - IS IT MADE, OR DOES IT HAPPEN?

STEPHEN E. DOYLE (Aerojet TechSystems Co., Sacramento, CA) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 551-562.

(AAS PAPER 86-364)

It is presently suggested that U.S. national space policies emerge through the uncoordinated interplay of various interests, frequently being strongly driven by personalities, with unilateral interruptions, and without cohesive structure and direction. The diffuseness of national space policymaking is due to its simultaneous conduct by Presidential administrations, congressional committees, the DOD, and NASA. A series of policy proposals is presented which encompass the commercialization

of launch operations by 1990, the establishment of lunar manned research stations by 2010, and full commitment to a transatmospheric vehicle's development.

O.C.

A88-35089

PUBLIC ATTITUDES AS OBSERVED BY THE NATIONAL COMMISSION ON SPACE

LEONARD W. DAVID (Space Data Resources and Information, Washington, DC) IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 563-570. refs

(AAS PAPER 86-385)

The National Commission on Space (NCOS) recently formulated an aggressive set of civilian space objectives, designed to allow the United States to move boldly into the 21st century. In order for the Commission to develop a useful agenda of potential projects, a series of country-wide Public Forums, various electronic surveys, and direct mail solicitation of opinions were carried out. This paper will outline public attitudes concerning the future of the U.S. civilian space program, and NCOS recommendations to foster continued support for new space initiatives, based upon the findings of its public forum series.

Author

A88-35092

POTENTIAL OF SPACE FOR HUMANITY

WTARU WAKAI TANAKA IN: Aerospace century XXI: Space missions and policy; Proceedings of the Thirty-third Annual AAS International Conference, Boulder, CO, Oct. 26-29, 1986. San Diego, CA, Univelt, Inc., 1987, p. 595-603.

(AAS PAPER 86-450)

An evaluation is made of Japanese attitudes on space colonization, as well as of their aptitude for participation in international efforts aimed at such colonization. A trust fund is proposed into which the heaviest users of petroleum-derived fuels pay in order to support space exploration, industrialization and colonization, in the form of such projects as an orbiting solar-power station. Attention is given to the concept of a 'cybernaut', a totally autonomous man-like robot capable of all space exploration tasks.

O.C.

A88-39498

BUILDING A EUROPEAN SPACE POLICY

HELEN WALLACE (Royal Institute of International Affairs, London, England) Space Policy (ISSN 0265-9646), vol. 4, May 1988, p. 115-120.

The results of a two-year study concerning Europe's future in space are given. The report, conducted by five European institutes, concluded that Western European nations must work together to expand their collective space activities. In the area of space transportation, the report concluded that Europe should build launchers and develop fully retrievable transportation systems. It was decided that Europe should develop its satellite capabilities, establish its own space station and create a Europe-wide system of ground facilities. Increasing industrial effectiveness, developing collaborative programs, and promoting technical innovation were stressed as well. In addition, it was decided to try to maintain a strong program in space science and research and to reinforce frameworks for collaboration. Although commercial and security dimensions of space were dealt with in the study, they were not included in Europe's space policy.

R.B.

A88-39499

SPACE COMMERCIALIZATION AND THE LAW

MICHEL BOURELY Space Policy (ISSN 0265-9646), vol. 4, May 1988, p. 131-142. refs

Legal aspects of the commercialization of space are examined, emphasizing international and national legislation, freedom for private enterprise, and state responsibility. The Outer Space Treaty, adopted by the U.N. in 1967, insures the freedom of space for exploration and use by governments and private companies, but states are responsible for insuring that privately-run space endeavors adhere to international law. The U.S., U.K. and Sweden

are the only countries to have enacted general national regulations of commercial space activities. The U.S. has established regulations of launch activities, while the member states of ESA have created specific regulations for Ariane launches. Up to now, there has been no need for specific national legislation concerning telecommunications, because general guidelines for use of radio frequencies are enforced by organizations like the FCC or European PTT authorities. Legislation concerning telecommunication may become necessary with the introduction of DBS. The U.N. has passed a resolution stressing the need for a code of conduct concerning earth observation, such as meteorology and remote sensing. R.B.

A88-40799

COLLOQUIUM ON THE LAW OF OUTER SPACE, 29TH, INNSBRUCK, AUSTRIA, OCT. 4-11, 1986, PROCEEDINGS

Colloquium sponsored by IAF. New York, American Institute of Aeronautics and Astronautics, 1987, 311 p. No individual items are abstracted in this volume.

National legislation and policies and international agreements on space activities are examined in reviews and reports representing a wide international range of viewpoints. Topics addressed include maintaining outer space for peaceful purposes, space communication and the regulation of GEO, space commercialization, and the history and teaching of space law. Particular attention is given to the common heritage of man doctrine, the legal implications of SDI, arms-control verification, legal problems of DBS TV, the 1985 WARC-ORB recommendations, traffic systems for near-earth space, INMARSAT as a mixture of public and private enterprise in space, and a comparison of the new Law of the Sea and space law. The teaching of space law is discussed in a series of national surveys. T.K.

A88-43970#

CREATING COMMERCIAL SPACE

GREG BARR (National Space Society, Washington, DC) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 199-206. refs

A review of the background, publicity and criticism surrounding the Commercial Space Incentive Act (CSIA) since its creation in May of 1986 with concluding remarks on the need for a new national space policy encouraging the privatization of space transportation. A summary and the complete text of the proposed legislation are included. Author

A88-43971#

FUNDING THE HIGH FRONTIER - A DIFFERENT APPROACH

S. DAVID EISENBERG IN: Space manufacturing 6 - Nonterrestrial resources, biosciences, and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 207-211.

Sometimes two problems are each other's solutions. The two problems to be addressed are capital formation for space resource utilization (High Frontier) and long term funding of demographically problematic pension and insurance programs (Social Security). An ordinary venture capital model of High Frontier funding is inappropriate and misleading, but a capital formation mechanism exists that would suffice for the tasks at hand were it not obstructed by short-sighted laws; legal and economic reform are therefore important. Taxes singled out for change are those on interest and dividends, capital gains, inheritance, income, and pensions. Non-tax areas to be changed are patent and copyright laws, age of majority for autonomous investing, and public capital good accounting and funding. Author

A88-43972#

SPACE LAW AND GOVERNMENT - A GENERATION LATER

JAMES E. DUNSTAN (Haley, Bader and Potts, Washington, DC) IN: Space manufacturing 6 - Nonterrestrial resources, biosciences,

and space engineering; Proceedings of the Eighth Princeton/AIAA/SSI Conference, Princeton, NJ, May 6-9, 1987. Washington, DC, American Institute of Aeronautics and Astronautics, 1987, p. 224-232. refs

In 1963, Andrew G. Haley, former President and General Counsel of the American Institute of Aeronautics and Astronautics published what was then, and still is today, one of the major works on Space Law, entitled Space Law and Government. The present paper attempts to place the developments in Space Law in historical perspective by reviewing what Haley said and predicted in that work, what has developed in the area of Space Law since 1963, and what the key issues in Space Law are likely to be in the coming decade. It is predicted that although Haley saw the critical need for international regulation of space activities, the self-interests of spacefaring nations, as well as the beginning of private uses of outer space, will result in a continued shift from regulation of space activities by international treaty to regulation by private contract and bilateral agreement, but that eventually, international mechanisms for dispute resolution will be required in the form of an additional international agreement. Author

A88-44867

COMMUNICATION SATELLITES IN THE GEOSTATIONARY ORBIT (2ND REVISED AND ENLARGED EDITION)

DONALD M. JANSKY and MICHEL C. JERUCHIM Norwood, MA, Artech House, Inc., 1987, 647 p. refs

Regulatory, policy, and technical considerations pertaining to communications satellites in geostationary orbit (GSO) are addressed, and methods of dealing with the problem of interference that such satellites encounter are considered. An overview and historical perspective on GSO is given, and communication satellite sharing of the GSO is discussed. International and domestic orbit-spectrum policy is examined. Factors affecting orbit-spectrum utilization are addressed for both the homogeneous case and the nonhomogeneous case. The performance of analog and digital signals in an interference environment, interference cancellation-reduction techniques, and software for orbit-spectrum utilization studies are discussed. C.D.

A88-48445

THE ROLE OF UNITED NATIONS DECLARATIONS OF PRINCIPLES IN THE PROGRESSIVE DEVELOPMENT OF SPACE LAW

VLADIMIR KOPAL (UN, Outer Space Affairs Div., New York) Journal of Space Law, vol. 16, no. 1, 1988, p. 5-20. refs

The legal nature of three UN declarations of principles governing international relations concerning space activities is examined. The 1963 Declaration of Legal Principles established the purposes of the exploration and use of outer space, characterized the legal status of space and celestial bodies, outlined the scope of legality of activities in space, and provided a set of initial rules for handling known problems of space activities. The 1982 Principles Governing Direct Television Broadcasting set basic requirements for states and other international organizations involved in international broadcasting. The 1986 Principles Relating to Remote Sensing allows for the sensed state to obtain access to the results of remote sensing and stresses the duty of sensing states to consult the sensed state. The historical development of these declarations and the reaction of the international community to these declarations are discussed. R.B.

A88-48446

REMOTE SENSING AND INTERNATIONAL SPACE LAW

CARL Q. CHRISTOL Journal of Space Law, vol. 16, no. 1, 1988, p. 21-44. refs

The UN Principles on Remote Sensing, which was approved in 1986, is presented in detail. The factors and key issues influencing the successful search for an agreement and are discussed, including conflicts concerning national privacy and sovereignty over natural resources, disagreement between sensing states and states without sensing capabilities, and differences in political and ideological perspectives. The negotiation process and

10 LEGALITY, LEGISLATION, AND POLICY

the final articles of the resolution are described. Also, the legal status and importance of the 1986 Principles are examined. R.B.

A88-48650#

U.S. COMMERCIAL SPACE TRANSPORTATION RISK ALLOCATION AND INSURANCE: AN AIAA POSITION PAPER
Washington, DC, American Institute of Aeronautics and Astronautics, 1988, 8 p.

Insurance and liability aspects of the ongoing U.S. effort to support the development of commercial launch services are examined. The system of risk assignment (RA) in place for NASA-provided launches of commercial payloads is reviewed: in such cases, the U.S. government (USG) assumes third-party liability for risks beyond those covered (with the USG as a nonpaying named insured) by reasonably priced insurance paid for by the commercial party. Consideration is then given to the types of risks and liability involved, the insurability of typical launch risks, the current RA situation (in which U.S. commercial launch services are forced to accept risks without adequate insurance, to avoid losing business); and the RA practices of foreign competitors (mainly following the NASA precedent). Legislation and regulations providing for some form of USG assumption or containment of uninsurable risks, as part of an RA plan similar to that for NASA launches, are strongly recommended. T.K.

A88-49051

LEADING THROUGH COOPERATION

JOHN M. LOGSDON (George Washington University, Washington, DC) Issues in Science and Technology (ISSN 0748-5492), vol. 4, Summer 1988, p. 43-47. refs

An attempt is made to formulate an alternative approach to the traditional insistence of planners on the achievement and preservation of the U.S.'s preeminence in space exploration and commercialization. The alternative policy suggested involves intensive collaboration with such major participants in space activities as the USSR, Western Europe, Canada, and Japan, and is predicated on the manifest similarities of goals in science policy and in the application of space technology among these nations. O.C.

A88-50300

THE COMMON INTEREST IN THE EXPLORATION, USE, AND EXPLOITATION OF OUTER SPACE FOR PEACEFUL PURPOSES - THE SOVIET-AMERICAN DILEMMA

CARL Q. CHRISTOL (Southern California University, Los Angeles, CA) CIDA, vol. 10, no. 10, 1985, p. 41-84. refs

The bases and prospects for U.S.-Soviet cooperation in space exploration are explored in the contexts of a general relaxation of ideological and geopolitical tensions and of the diversion of weapons and military personnel expenditures to benevolent exploitation of the space environment. Attention is given to the emergence of the problem of antisatellite technologies, public efforts by the Soviet Union to deal with the antisatellite problem, the major initiatives toward the relaxation of superpower tensions in space that have been undertaken by the United Nations, the involvement of the U.S. Congress in space militarization issues, and progress made in U.S.-U.S.S.R. talks since mid-1984. O.C.

A88-50901

PASSENGER PROTECTION TECHNOLOGY IN AIRCRAFT ACCIDENT FIRES

NEVILLE BIRCH (Rolls-Royce, PLC, Derby, England) Aldershot, England, Gower Technical Press, 1988, 160 p. refs

Techniques for protecting passengers from the effects of fire in otherwise survivable aircraft accidents are evaluated, and specific recommendations involving the expansion of current ground-based fire-fighting capabilities are presented. Chapters are devoted to the origin and characteristics of aircraft fires, heat, smoke and toxic gases, factors affecting evacuation, the internal cabin fire, evacuation-chute protection, smoke hoods, and aircraft security. Diagrams, graphs, and tables of numerical data are provided. T.K.

A88-51742

PUBLIC POLICY ISSUES IN SATELLITE COMMUNICATIONS AND REMOTE SENSING

THOMAS L. MCPHAIL (Calgary, University, Canada) IN: Satellites international. New York, Stockton Press, 1987, p. 57-60. refs

Policy issues relating to telecommunications are discussed, including international use of the geostationary satellite orbit, remote sensing of earth resources, and direct satellite broadcasting of television signals. The UN provisions for international activities in outer space are examined, pointing out which issues have yet to be resolved. The question of the sovereignty of equatorial countries over the space above their nations, and the relationship between sensed states and states with remote sensing capabilities are considered. Other issues include whether or not individuals should have the right to receive any broadcast information they wish to receive, the problem of broadcasting propaganda, and the question of whether or not a nation must give prior consent before a program is broadcast to that nation. R.B.

A88-53527

COLLATERAL ESTOPPEL - THE FAIRNESS EXCEPTION

STEVEN C. MALIN Journal of Air Law and Commerce (ISSN 0021-8642), vol. 53, Summer 1988, p. 959-995. refs

The doctrine of collateral estoppel, or issue preclusion, which prevents a party from contesting an issue that has previously been litigated and lost, is examined. The doctrine of mutuality of estoppel, which prevents a person from taking advantage of a judgment to which he was not bound, and the ways in which this doctrine has been handled in the California Supreme Court and in Federal Court are discussed. Collateral estoppel in air crash cases is considered. Justifications for allowing estoppel in the absence of mutuality include the vexation of multiple suits, the conservation of judicial resources, inconsistent judgments, and the notion that a party should have only one full and fair chance to litigate any particular issue. It is proposed that a rule ensuring that a defendant in an action may not be collaterally estopped by an adversary upon an issue decided in a prior action to which the adversary was not a party unless the adversary had agreed to be bound thereby should be adopted. R.B.

N88-10696# General Accounting Office, Washington, DC. National Security and International Affairs Div.

BUDGET REIMBURSEMENTS: THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION'S REIMBURSABLE WORK

Jun. 1987 19 p
(PB87-207296; GAO/NSIAD-87-171FS; B-227311) Avail: NTIS HC A03/MF A01 CSCL 05C

The fact sheet responds to a congressional request for information about the National Aeronautics and Space Administration's (NASA) reimbursement. It: (1) describes how reimbursements impact on NASA's funding requirements; (2) provides the amount of estimated total reimbursements for fiscal year 1987; and (3) provides information on the amount, type, and source of reimbursements in fiscal year 1985 for the Space Flight Control and Data Communications and Research development accounts. GRA

N88-11573# General Accounting Office, Washington, DC. General Government Div.

FREEDOM OF INFORMATION ACT: FEE WAIVER PRACTICES AT THE FBI (FEDERAL BUREAU OF INVESTIGATION)

Jun. 1987 24 p
(PB87-216727; GAO/GGD-87-73BR; B-221963) Avail: NTIS HC A03/MF A01 CSCL 05B

The report reviews how the Federal Bureau of Investigation (FBI) administers the provision of the Freedom of Information Act (FOIA) pertaining to the waiver of fees charged on information requests. The objectives of the review at the FBI were to: (1) identify and describe the procedures and standards used in making fee waiver decisions, and (2) provide information on how the procedures and standards were applied to specific fee waiver requests. GRA

N88-11574# Computer Horizons, Inc., Haddon Heights, NJ.
IDENTIFYING AREAS OF LEADING EDGE JAPANESE SCIENCE AND TECHNOLOGY: ACTIVITY ANALYSIS USING SIC (STANDARD INDUSTRIAL CLASSES) CATEGORIES AND SCIENTIFIC SUBFIELDS Interim Technical Report No. 1, 1975 - 1984

F. NARIN and D. OLIVASTRO 19 May 1986 96 p
 (Contract NSF SRS-85-07306)
 (PB87-204087) Avail: NTIS HC A05/MF A01 CSCL 05A

The growth of Japanese patenting is particularly apparent with the Japanese invented U.S. patents increasing from approx. 8.8 percent in 1975 to 16.5 percent of U.S. patents in 1984. In scientific papers the Japanese increased from approx. 5.1 percent in 1973 to 7.3 percent in 1982. The broad areas of emphasis of the two countries are also shown to be in strong contrast. In science the Japanese show a particularly emphasis in chemistry and physics with an average emphasis in bioscience. In contrast the U.S. shows emphasis in earth and space science, and notable emphasis in the biomedical fields of clinical medicine and biomedical research. Field by field Japanese and U.S. science activity correlate at 0.90, almost total opposites. In technology also there are sharp contrast, with Japanese activity notably high in various areas related to electronics, automotive, photography, scientific instrumentation and office computing. These areas of high Japanese activity are also areas in which they have increased their activity over the last ten years: in fact, the Japanese have increased their share in 40 of the 42 different product fields. GRA

N88-11575# Computer Horizons, Inc., Haddon Heights, NJ.
IDENTIFYING AREAS OF LEADING EDGE JAPANESE SCIENCE AND TECHNOLOGY: PATENT ACTIVITY AND CITATION ANALYSIS USING US POC (PATENT OFFICE CLASSIFICATION) CLASSIFICATION Interim Technical Report No. 2, 1975 - 1984

F. NARIN and D. OLIVASTRO 5 Sep. 1986 72 p
 (Contract NSF SRS-85-07306)
 (PB87-204095) Avail: NTIS HC A04/MF A01 CSCL 05A

Analysis of Japanese invented patents appearing in the U.S. patent system over the 10 yr period 1975 to 1984, shows that the share of U.S. patents with Japanese inventors increased from 8.8 percent of all U.S. patents in 1975 to 16.5 percent in 1984, while the share of patents with U.S. inventors decreased from 64.9 to 57.1 percent. Japanese inventors obtained 8 percent more U.S. patents while U.S. inventors obtained 8 percent fewer, and the rest of the world's inventors remained approx. constant. In the U.S. patent system, the increase in Japanese share was entirely at the expense of the U.S. The Japanese patents are shown to be quite concentrated in relatively high technology classes related to those areas of consumer products where there is a major Japanese presence, including electronics, photography, and automotive technology. There is also a growing Japanese presence in the pharmaceutical area. When looked at from the point of view of citation analysis, that is considering highly cited patents to be patents of particular technical impact and quality, the Japanese performance is just as impressive. The Japanese position in patented technology appears to be strong, growing and based on high quality. GRA

N88-12199# Committee on Commerce, Science, and Transportation (U.S. Senate).

GLOBAL ENVIRONMENTAL CHANGE RESEARCH
 Washington GPO 1987 156 p Hearing before the Subcommittee on Science, Technology and Space and the National Ocean Policy Study of the Committee on Commerce, Science and Transportation, 100th Congress, 1st Session, 16 Jul. 1987 (S-HRG-100-301; GPO-77-482) Avail: Subcommittee on Science, Technology and Space

Testimony of various government and university scientists, including a representative of NASA, before the subcommittee is presented. The status of research on manmade environmental changes is reported with the goal of informing national research policy in this area. J.P.B.

N88-12422# Committee on Science and Technology (U.S. House).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1988

Washington GPO 1987 19 p H.R. 2782 enacted into law by the 100th Congress, 2d session, 30 Oct. 1987 (PUB-LAW-100-147) Avail: US Capitol, House Document Room

Appropriations were authorized to the National Aeronautics and Space Administration for research and development; space flight, control, and data communications; constructions of facilities; and research and program management; and for other purposes.

Author

N88-12424# Committee on Appropriations (U.S. Senate).

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1988, THURSDAY, 9 APRIL 1987: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

In its Department of Housing and Urban Development, and Certain Independent Agencies Appropriations, 1988, Part 2 p 1019-1115 1987

Avail: Committee on Appropriations

Oral and written statements of the NASA Administrator before the subcommittee are presented, as well as written questions and responses to them. Areas of emphasis include plans for an orbital space station and heavy lift launch capability. J.P.B.

N88-12425# Committee on Appropriations (U.S. Senate).

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1988, FRIDAY, 10 APRIL 1987: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

In its Department of Housing and Urban Development, and Certain Independent Agencies Appropriations, 1988, Part 2 p 1117-1197 1987

Avail: Committee on Appropriations

Oral and written testimony of the NASA Administrator before the subcommittee is presented. The emphasis is on plans for an orbital space station, heavy lift launch vehicles, the resumption of shuttle flights, the Hubble Space Telescope, and aircraft energy efficiency. Some attention is given to other NASA space exploration and new technology programs. J.P.B.

N88-14043# Committee on Appropriations (U.S. Senate).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SPACE STATION PROPOSAL, FISCAL YEAR 1988

Washington GPO 1987 281 p Hearings before the Committee on Appropriations, 100th Congress, 1st Session, 1 and 20 May 1987

(S-HRG-100-328; GPO-76-948) Avail: Committee on Appropriations

Hearings were held to ascertain non-NASA expert opinion on the advisability of and options for a U.S. orbital space station. Scientists, academics, engineers, and businessmen expressed opinions on the desirability of funding a space station as opposed to other possible space priorities. The second day of hearings concentrated on opinions regarding the commercial potential of a space-station. J.P.B.

N88-14044# Committee on Science, Space and Technology (U.S. House).

THE 1988 NASA (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION) AUTHORIZATION

Washington GPO 1988 77 p Hearing before the Subcommittee on Space Science and Applications of the Committee on Science, Space and Technology, 100th Congress, 1st Session, No. 43, 8 Apr. 1987

(GPO-80-245) Avail: Subcommittee on Space Science and Applications

Space Stations configuration and cost reviews are discussed in terms of the commitment of the United States to a permanently manned Space Station. Congressional approval to release Request for Proposals to industry for a phased development of the space

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station is sought, including estimates for an enhanced capability configuration. Also described is the revised baseline and the enhanced configuration. B.G.

N88-14854 Committee on Science, Space and Technology (U.S. House).

THE 1988 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) AUTHORIZATION

Washington GPO 1987 1206 p Hearings before the Subcommittee on Space Science and Applications of the Committee on Science, Space and Technology, 100th Congress, 1st Session, No. 35, Vol. 2, 5, 24-25 Feb.; 3, 5, 10-11, 18-19, 31 Mar.; 23 Apr. and 6 May 1987 (GPO-76-600) Avail: Subcommittee on Space Science and Applications

The fiscal year 1988 budget request is examined for the National Aeronautics and Space Administration programs which include: orbital space station; resumption of shuttle flights; expendable launch vehicles (ELVs); research and development; space transportation system; construction; and Advanced Communication Technology Satellite (ACTS). B.G.

N88-15732* National Aeronautics and Space Administration, Washington, DC.

NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 32)

Jan. 1988 61 p (NASA-SP-7039(32)-SECT-1-ABST; NAS 1.21:7039(32)-SECT-1-ABST) Avail: NTIS HC A04; NTIS standing order as PB 88-911100, \$12.50 domestic, \$25.00 foreign CSCL 05B

Abstracts are provided for 136 patents and patent applications entered into the NASA scientific and technical information system during the period July through December 1987. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

N88-15817*# National Aeronautics and Space Administration, Washington, DC.

ADVANCING AUTOMATION AND ROBOTICS TECHNOLOGY FOR THE SPACE STATION AND FOR THE US ECONOMY: SUBMITTED TO THE UNITED STATES CONGRESS MAY 15, 1987 Progress Report No. 4, Oct. 1986 - 15 May 1987

May 1987 61 p (NASA-TM-89811; NAS 1.15:89811) Avail: NTIS HC A04/MF A01 CSCL 22A

In April 1985, as required by Public Law 98-371, the NASA Advanced Technology Advisory Committee (ATAC) reported to Congress the results of its studies on advanced automation and robotics technology for use on the space station. This material was documented in the initial report (NASA Technical Memorandum 87566). A further requirement of the Law was that ATAC follow NASA's progress in this area and report to Congress semiannually. This report is the fourth in a series of progress updates and covers the period October 1, 1986 to May 15, 1987. NASA has accepted the basic recommendations of ATAC for its space station efforts. ATAC and NASA agree that the will of Congress is to build an advanced automation and robotics technology base that will support an evolutionary space station program and serve as a highly visible stimulator affecting the long-term U.S. economy. The progress report identifies the work of NASA and the space station study contractors, research in progress, and issues connected with the advancement of automation and robotics technology on the space station. Author

N88-16724# European Space Agency, Paris (France). Dept. of International and Legal Affairs.

A POLICY FOR INTERNATIONAL RELATIONS

H. KALTENECKER *In its* ESA Bulletin No. 8 p 29-44 Feb. 1977

Avail: NTIS HC A05/MF A01

The relations between ESA and its organs and the governments

and institutions of non-member states and international organizations are discussed. Author (ESA)

N88-18046*# National Aeronautics and Space Administration, Washington, DC.

SPACE-BASED REMOTE SENSING OF THE EARTH: A REPORT TO THE CONGRESS

Sep. 1987 147 p Original document contains color illustrations Prepared in cooperation with National Oceanic and Atmospheric Administration, Washington, D.C. (NASA-TM-89709; NAS 1.15:89709) Avail: SOD HC \$9.00 as 033-000-00983-6; NTIS MF A01 CSCL 08B

The commercialization of the LANDSAT Satellites, remote sensing research and development as applied to the Earth and its atmosphere as studied by NASA and NOAA is presented. Major gaps in the knowledge of the Earth and its atmosphere are identified and a series of space based measurement objectives are derived. The near-term space observations programs of the United States and other countries are detailed. The start is presented of the planning process to develop an integrated national program for research and development in Earth remote sensing for the remainder of this century and the many existing and proposed satellite and sensor systems that the program may include are described. Author

N88-18503# Indo-US Subcommittee on Science and Technology, Washington, DC.

MINUTES OF THE MEETING OF THE INDO-US SUBCOMMISSION ON SCIENCE AND TECHNOLOGY (8TH) HELD AT WASHINGTON, D.C. ON SEPTEMBER 22-24, 1986

1986 89 p Meeting held in Washington, D.C., 22-24 Sep. 1986 (PB88-130158) Avail: NTIS HC A05/MF A01 CSCL 05A

To carry out the objectives of the agreement in various fields of science and technology, the Indo-U.S. Subcommittee on Science and Technology was established in January 1975. Since then it has met on eight occasions in either Washington or New Delhi and has played an important role in fostering the development of collaborative research projects of mutual interest as well as closer ties between the scientific communities of both countries. The Secretary of the Department of Science and Technology on the Indian side, and the Assistant Secretary of State for Oceans and International Environment and Scientific Affairs on the U.S. side, co-chair the meetings of the Subcommittee. More than two dozen technical agencies from both sides participate in the activities of the Subcommittee. The work of the Subcommittee is carried out by Working Groups in physical and materials science; earth, atmospheric, and marine sciences; energy; environment and ecology; information science and technology; and health, medical, and life sciences. The document presents the minutes of the Eighth Meeting of the Indo-U.S. Subcommittee on Science and Technology which was held in Washington, D.C., September 22-24, 1986, and reports on the deliberations of the various Working Groups. Author

N88-18511* National Aeronautics and Space Administration, Washington, DC.

NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES (SUPPLEMENT 32)

Jan. 1988 499 p (NASA-SP-7039(32)-SECT-2; NAS 1.21:7039(32)-SECT-2) Avail: NTIS HC A21; NTIS standing order as PB88-911100, \$26.50 domestic, \$53.00 foreign CSCL 05B

A subject index is provided for over 4700 patents and patent applications for the period May 1969 through December 1987. Additional indexes list personal authors, corporate authors, contract numbers, NASA case numbers, U.S. patent class numbers, U.S. patent numbers, and NASA accession numbers. Author

N88-20208*# National Aeronautics and Space Administration, Washington, DC.

SELLING TO NASA

Nov. 1986 47 p Original contains color illustrations

(NASA-TM-89724; NAS 1.15:89724) Avail: NTIS HC A03/MF A01; also available SOD HC \$3.25 as 033-000-009-95-0 CSCL 05A

Prospective contractors are acquainted with the organizational structure of NASA, and the major technical program offices and selected staff offices at the Headquarters level are briefly described. The basic procedures for Federal procurement are covered. A primer is presented on how to market to NASA. While the information is specific to NASA, many of the principles are applicable to other agencies as well. Some of the major programs are introduced which are available to small and disadvantaged businesses. The major research programs and fields of interest at individual NASA centers are summarized. B.G.

N88-20222# Office of Technology Assessment, Washington, DC.

SCIENCE, TECHNOLOGY AND THE CONSTITUTION: BACKGROUND PAPER

Sep. 1987 33 p

(PB88-142534; OTA-BP-CIT-43; LC-87-619873) Avail: NTIS HC A03 MF A01; also available SOD HC \$1.50 as 052-000-010-86-1 CSCL 05D

The centrality of science and technology to American society argues that Congress and the courts will repeatedly be asked to reexamine constitutional principles in the context of scientific knowledge and technical capabilities. Stimulation of the continuing public discussion of the relationships between science, technology, and basic constitutional provisions is sought. GRA

N88-21087# Executive Office of the President, Washington, DC.

AERONAUTICS AND SPACE REPORT OF THE PRESIDENT: 1986 ACTIVITIES

1986 141 p

Avail: NTIS HC A07/MF A01

The achievements of aeronautics and space programs in the United States for 1986 are summarized in the areas of communications; Earth atmosphere, environment, and resources; space science; space transportation; commercial use of space; space tracking and data systems, space station; and aeronautics and space research and technology. The achievements of each of the following organizations are described: NASA, the Departments of Defense, Commerce, Energy, Interior, Agriculture, Transportation and State, the Federal Communications Commission, Environmental Protection Agency, National Science Foundation, Smithsonian Institution, Arms Control and Disarmament Agency and USIA. Appendices provide historical information on launches, satellites, manned and unmanned spacecraft, and Federal budgets for aeronautical and astronautical activities. Author

N88-23689# Committee on Appropriations (U.S. House).

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT INDEPENDENT AGENCIES APPROPRIATIONS FOR 1989. PART 7: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington GPO 1988 1137 p Hearings before a subcommittee of the Committee on Appropriations, 100th Congress, 2d Session, 19 Apr. 1988, part 7

(GPO-85-166) Avail: Committee on Appropriations, House of Representatives, Washington, D.C. 20515 HC free

Hearings before a subcommittee of the House Committee on Appropriations are presented along with the budget estimates for the National Aeronautics and Space Administration for the fiscal year 1989. All written testimony and submittals for the record are also included. The budget estimates provide a detailed outline of budgetary information and justifications for research and development, construction of facilities, space flight and communications, and research and program management. M.G.

N88-24410# Department of Energy, Washington, DC.

UNITED NATIONS DELIBERATIONS OF THE USE OF NUCLEAR POWER SOURCES IN SPACE: 1978-1987

GARY L. BENNETT, JOSEPH A. SHOLTIS, JR., and BRUCE C.

RASHKOW (State Dept., Washington, D. C.) /in New Mexico Univ., Transactions of the Fifth Symposium on Space Nuclear Power Systems p 171-175 1988 Sponsored by NASA, Washington, D.C. and DOD, Washington, D.C. Avail: NTIS HC A99/MF A01 CSCL 05D

The United Nations (U.N.) is continuing its deliberations on the use of nuclear power sources (NPS) in space. Although no complete set of legal principles has yet been agreed upon, certain scientific and technical criteria for the safe design and use of NPS have been accepted. In this respect, it should be noted that in its 1981 report, the Working Group on the Use of Power Sources in Outer Space concluded that power sources can be used safely in outer space, provided that all necessary safety requirements are met. This is also a succinct statement of the U.S. position. Author

N88-24411# State Dept., Washington, DC.

DISCUSSIONS AND AGREEMENTS IN THE UNITED NATIONS ON IMPORTANT ISSUES ASSOCIATED WITH NUCLEAR POWER IN SPACE

BRUCE C. RASHKOW, THEODORE A. BOREK, EDWARD KEHELEY, NATHAN J. HOFFMAN, and BRUCE B. GILLIES (Energy Technology Engineering Center, Canoga Park, Calif.) /in New Mexico Univ., Transactions of the Fifth Symposium on Space Nuclear Power Systems p 177-179 1988

Avail: NTIS HC A99/MF A01

The United Nations (U.N.) has not agreed on a definition of a nuclear safe orbit below which a member state cannot have an operating nuclear power supply. The U.N. has not agreed on the definition of a reentry configuration for a nuclear power supply. Although the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space previously adopted a draft principle relating to the notification of the states concerned and the Secretary General by the launching state of the possible unintentional reentry of a nuclear power supply, that principle has been reopened for discussion. A draft principle for assistance by the launching country to nations affected by reentry has been reopened for discussion. The U.N. has not proscribed plutonium as a fuel for a space power reactor or isotopic heat source. The U.N. has not agreed upon a required orbital altitude or orbit decay time as a function of nuclear reactor power level. Author

N88-25373# General Accounting Office, Washington, DC. Accounting and Financial Management Div.

FINANCIAL REPORTING: NASA (NATIONAL AERONAUTICS AND SPACE ADMINISTRATION) CAN IMPROVE COMPLIANCE WITH GAO (GENERAL ACCOUNTING OFFICE) STANDARDS AND TREASURY REQUIREMENTS

Feb. 1988 18 p

(PB88-172523; GAO/AFMD-88-21) Avail: NTIS HC A03/MF A01 CSCL 05A

The results are presented of the authors review of the National Aeronautics and Space Administration's preparation of its fiscal year 1986 Report on Financial Position, commonly referred to as a balance sheet. The review, one segment of a government wide effort, was performed to determine the extent of compliance with the General Accounting Office's and the Department of the Treasury's annual financial reporting requirements. Author

N88-25379# Department of Defense, Washington, DC.

THE DEPARTMENT OF DEFENSE REPORT ON THE MERIT REVIEW PROCESS FOR COMPETITIVE SELECTION OF UNIVERSITY RESEARCH PROJECTS AND AN ANALYSIS OF THE POTENTIAL FOR EXPANDING THE GEOGRAPHIC DISTRIBUTION OF RESEARCH FOR THE COMMITTEES ON APPROPRIATIONS, UNITED STATES CONGRESS

Apr. 1987 33 p

(AD-A191842) Avail: NTIS HC A03/MF A01 CSCL 05A

This report responds to the Committee on Conference request, DoD Appropriations Act, 1987 as set forth in the following. With the establishment of the University Research Initiative in fiscal year 1986 and rising funds for the Strategic Defense Initiative, the Department of Defense's investment in university-based research

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is increasing. Consequently, the appropriations Committees need to ensure that the peer review process for the allocation of university funding is working effectively, and that mechanisms are in place to broaden the base of DoD university research commensurate with these increasing resources. Therefore, the conferees direct the Department of Defense to submit a report to the Appropriations Committees by March 1, 1987, which (1) explains in detail the current peer review process in a step-by-step fashion; (2) explains current participants in this process, including peer review panels, boards, or conferences, and how such peer reviewers are evaluated and chosen; and (3) an analysis of the potential for expanding the research base into geographical areas which at the present time receive little defense-related university funding. This report explains DoD's merit review process and the participants in that process and also describes the current distribution of DoD research funding to universities and the potential for geographic expansion. GRA

N88-25388* National Aeronautics and Space Administration, Washington, DC.

NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS

Jul. 1988 25 p
(NASA-SP-7039(33); NAS 1.21:7039(33)) Avail: NTIS HC A03
CSCL 05B

Abstracts are provided for 16 patents and patent applications entered into the NASA scientific and technical information systems during the period January 1988 through June 1988. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application. Author

N88-29233*# National Aeronautics and Space Administration, Washington, DC.

PRESENT STATE OF KNOWLEDGE OF THE UPPER ATMOSPHERE 1988: AN ASSESSMENT REPORT

R. T. WATSON, M. J. PRATHER, and M. J. KURYLO Jun. 1988
203 p
(NASA-RP-1208; NAS 1.61:1208) Avail: NTIS HC A10/MF A01
CSCL 04A

This document was issued in response to the Clean Air Act Amendments of 1977, Public Law 95-95, mandating that NASA and other key agencies submit biennial reports to Congress and EPA. NASA is to report on the state of our knowledge of the upper atmosphere, particularly the stratosphere. This is the sixth ozone assessment report submitted to Congress and the concerned regulatory agencies. Part 1 contains an outline of the NASA Upper Atmosphere Research Program and summaries of the research efforts supported during the last two years. An assessment is presented of the state of knowledge as of March 15, 1988 when the Ozone Trends Panel, organized by NASA and co-sponsored by the World Meteorological Organization, NOAA, FAA and the United Nations Environment Program released an executive summary of its findings from a critical in-depth study involving over 100 scientists from 12 countries. Chapter summaries of the International Ozone Trends Panel Report form the major part of this report. Two other sections are Model Predictions of Future Ozone Change and Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling. Each of these sections and the report in its entirety were peer reviewed. Author

N88-29632# General Accounting Office, Washington, DC. National Security and International Affairs Div.

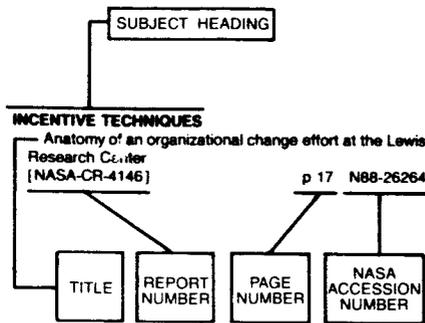
COMPETITION: ISSUED ON ESTABLISHING AND USING FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

Mar. 1988 57 p
(PB88-178884; GAO/NSIAD-88-22) Avail: NTIS HC A04/MF
A01 CSCL 05A

The national defense role of Federally Funded Research and Development Centers is documented. Information is presented on the placement of research and development work at 12 centers: 10 sponsored by the Department of Defense and 2 sponsored by the Department of Energy. Author

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of the document content, the title extension is added, separated from the title by three hyphens. The (NASA or AIAA) accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence with the AIAA accession numbers appearing first.

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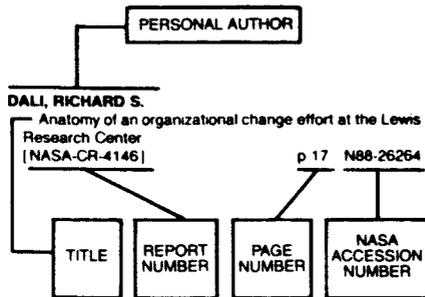
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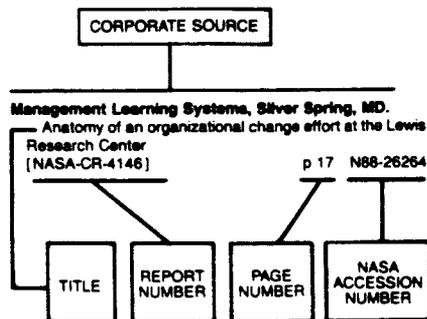
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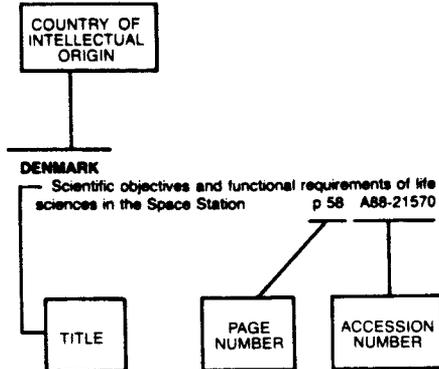
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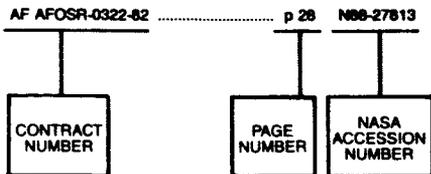
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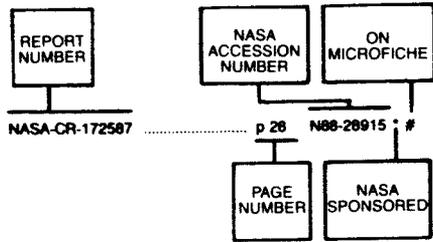
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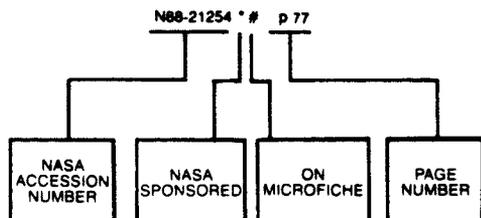
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